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Cropping Strategy Cash Flow Analyzer: Use to Compare Low Input Traditional Cropping Systems and High Input Soil Saver Systems

Task 2B
Farm Enerdemo

by
R. Bens
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Saskatoon, Saskatchewan

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CROPPING STRATEGY CASH FLOW ANALYZER:

USE TO COMPARE

LOW INPUT TRADITIONAL CROPPING SYSTEMS

AND HIGH INPUT SOIL SAVER SYSTEMS

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EXECUTIVE SUMMARY

A simple menu-driven cash flow analyzer program was developed to analyze cash flow characteristics and the level of use of energy intensive inputs for low input traditional cropping systems and high input soil saver systems.

Benchmark data sets were developed to provide input/output information for different soil types in all 3 soil zones. The analysis carried out based on the benchmark data was used to compare costs on a per unit of output and per farm basis. The analysis revealed that operating costs can be expected to be 11-25% higher per bushel and 56-77% higher per year per farm for the soil saver systems.

The "volume effect" can made the soil saver systems more efficient in terms of total cost per unit of output when fixed costs are spread over more bushels. However, at prices in the $3 range, the volume effect will work in reverse, and losses will be maximized. Under the soil saver system at prices in the $5 range, short term capital rationing should not be a problem and the soil saver system can be expected to have a better net cash flow than the traditional low input system in all 3 soil zones.

Farmers are skeptical about changeover to soil saver systems because of uncertainty about the comparative level and variabil-

ity of yields, and the difficulty in financing the operations when prices are low. Technological and market uncertainties combine to make changeover very difficult, especially in the Brown and D. Brown soil zones.

The mix and level of high energy inputs per unit of output is very different under the two systems. The traditional summerfallow intensive systems are more efficient in the use of energy intensive inputs. Although traditional systems use more fuel, they use less fertilizer and chemicals per unit of output.

There is a conflict between long term conservation of soils and conservation of high energy inputs. The cost of soil conservation through soil saver cropping systems could be described as a loss in efficiency in the use of high energy inputs in the short term. While this phenomena could be associated with an increase in soil productivity over time, the necessary quantitative relationships are not clear enough for most farm decision makers. The efficiency implications for the long term are indeterminate.

1.0 INTRODUCTION

This is the final report for Task 2 Component B of the ENERDEMO Program, completed for the Saskatchewan Research Council and Energy, Mines & Resources Canada.

The management information and decision process provided the focus for Task 2B. Researchers have developed intensive farming technology which can replace summerfallow even in the drier areas of western Canada. However, farmers are uncertain about the cash flow consequences of these new systems and decisions to adopt the new technology are difficult for many farmers. There is also uncertainty about the energy consequences of moving to more intensive systems, particularly insofar as these consequences effect cash flow.

Farmers are generally concerned about soil degradation, and most probably realize that high tillage summerfallow cropping systems contribute to it. The important question for farmers is whether they can afford to move to more intensive cropping systems. This question provides the focus for this project.

2.0 OBJECTIVES

The general objective of this analysis was to focus on the summerfallow vs. cropping decision in all Soil Zones, with the traditional 1/2:1/2 system and continuous crop systems as the standards for comparison. The purpose was to compare energy intensive inputs and examine cash flow characteristics for "low input" tradition systems and "high input" continuous crop systems.

To facilitate this analysis, a simple computer program developed under the Farm Energy Management Program (Sask. Research Council) was adapted to incorporate graphics displays of cash flow and input levels under these alternate systems.

A final objective was to carry out a farm management analysis of cropping systems, and to make presentations of the findings to farmers, extension workers and researchers, including popular articles on this topic for the farm press.

3.0 METHODOLOGY

3.1 Developing The Program

The program was developed by Farmwest Management Ltd. as a menu-driven designed for ease of data entry and simplicity of output.

The program was constructed to analyze low input traditional 1/2:1/2 systems and/or hi-input continuous crop systems designed for "saving soils".

Several farmers, extension workers, researchers, programmers and consultants were contacted during the program development. As a result, there are several unique features of the "Farmwest Cash Flow Analyzer Program". These include the simplicity of a menu driven program, outcomes displayed in graphics, a random feature for yields on multi-year runs, a summary of costs for selected energy intensive inputs, and a summary of sensitivity of outcomes to price changes.

See Appendix A for a copy of the program description, user instructions and samples of the output generated.

3.2 Developing the Data

Benchmark data sets were developed using information from the Farm Energy Management Program (SRC), Saskatchewan Department of Agriculture, Innovative Acres Reports (U of S), farmer participants in the ENERDEMO Program, and from client data files of Farmwest Management Ltd.

The low input traditional systems are characterized by:

- low fertilizer inputs
- low chemical inputs
- high tillage inputs

The high input soil saver systems are characterized by:

- high fertilizer inputs
- high chemical inputs
- lower tillage costs

For the low input system, the "high tillage" substitutes for the high fertilizer and chemical inputs found in the soil saver system.

The typical equipment configuration for the low input traditional system is a large tillage compliment using discers

and drills for seeding and swathers and field drying for harvest. In contrast, the typical configuration for a soil saver system is airseeding technology for applying fertilizer, and a large seeding and harvesting compliment, relying more on artificial drying of crops.

The new continuous crop soil saver systems rely on new technology which can increase water use efficiency. This includes options such as snow management and high fertilizer inputs to ensure effective use of available water. As a result the benchmark data developed for the soil saver systems rely heavily on recent research and demonstration data, based on what is possible at the leading edge of the new technology.

The data for the traditional summerfallow intensive systems is based on observation of successful summerfallow cropping operations. The system in not new and the relationships are tested over time.

See Appendix B for a summary of the benchmark data used for the comparative analysis.

3.3 Method of Analysis

The analysis was based on wheat as a single crop using 3 year projections for comparison.

Estimates of land prices, productivity and equipment requirements were used to arrive at farm sizes which would represent similar capital investments:

- Brown Soil Zone - 1,800 acres
- D. Brown Soil Zone - 1,500 acres
- Black Soil Zone - 1,200 acres

An estimate of cash required for family living was fixed at $25,000. Cash required for debt service at $25,000 (P + I) was also assumed. This P + I is roughly consistent with (say) $125,000 in long term land debt and $25,000 in intermediate debt for machinery and equipment.

Various quota prices were used, with the pricefor overquota production discounted by 20% per bushel. For simplicity, no storage strategies or price trends were used.

An estimate of nitrogen loss was also identified to reflect N fertilizer cost "escaped" in the low input system. For simplicity, this "loss" from the soil was estimated at $.55/bushel of yield (or about 2 lb. N for each bushel).

3.4 Demonstration

The program was used to analyze the cropping system decision for an article for the Country Guide in the Spring of

1986. The article entitled, Will Stubble Cropping Pay in 1986, was published in March of 1986. See Appendix C for a copy of this article.

The benchmark data was used for analysis for a paper presented to the Crops and Soils Workshop field at the U of S in February of 1987. The paper entitled, Business Analysis of Cropping Systems, was published in the Workshop proceedings published in June, 1987. See Appendix C.

The program was also demonstrated at the 1986 AIC annual convention. Farmwest personnel provided a computer for the display and several researchers and extension workers successfully operated the program using the simple menu instructions provided.

The program was also used for one on one demonstrations with farmers. Approximately, twenty farmers used the program with their own data. These contacts occurred in most cases at the Farmwest office. However, some farmers used the program at SDA offices with the assistance of Farmwest personnel and/or SDA extension staff.

For demonstration purposes, individual farmers could choose to run through the analysis using the menu data already in the program, or they could choose to enter data from their own farm situation.

The default data is accessed by entering the R.M. number, identifying the acreage and whether the soil in question should be a "light, medium, or heavy". The analysis can then proceed using the yield possibilities and input costs appropriate for the land and soil zone. The results can then be viewed several seconds later in graphics form.

For one on one demonstrations a complete set of specific farm data can be entered and data reports printed. Approximately 30 minutes is required to enter the individual farmer's data and to print reports. See Appendix C for an example of a complete data report including graphics.

4.0 RESULTS

This section summarizes the results of economic comparisons using the benchmark data outlined in Appendix B.

4.1 Yield Potential

Yields for summerfallow and continuous crop wheat were estimated based on several assumptions. Yield potential was estimated based on soil type, water use efficiency and specified levels of fixed and variable inputs. See Table 1.

TABLE 1: Benchmark Wheat Yields

Soil Zone*	Low Input	Soil Saver		
			% of low input	CM water used
	bu/ac	bu/ac	%	CM
Black	40	32	80	30
D. Brown	35	26	74	26
Brown	30	21	70	22

* Estimate given for medium textured soils.

The continuous crop yields estimated in Table 1 represent the potential based on research data and on the experience of some innovative farmers, including some of the participants in the Farm Energy Management and ENERDEMO Programs. The water use efficiencies are clearly possible under commercial conditions,

but these targets do require energetic attention to fertilizer and chemical programs, and to snow trapping and other practices which conserve available moisture. Therefore, the soil saver option requires a higher level of inputs and a superior level of management in order to achieve the targets given in Table 1.

Yield variability is also an important consideration for a complete farm management analysis. The random yield feature of the Analyzer program permits comparisons of risk and uncertainty. In order to achieve simplicity for the present analysis however, the average expectations given in Table 1 were used for the analysis.

For examples of the actual yield ranges considered appropriate, see Table 2.

TABLE 2: Benchmark Yield Ranges

Soil Zone*	Low Input		Soil Saver	
	Range	+ or - From Mean	Range	+ or - From Mean
	bu/ac		bu/ac	
Black	32-48	8	20-44	12
D. Brown	26-44	9	10-42	16
Brown	18-42	12	5-37	16

* Estimates given for medium textured soils.

The increased variability will affect the decisions of individual farmers, based on the farmer's reaction to risk and uncertainty in the farm operation. The importance of the yield variability question is further underlined by consideration of the total operating capital which has to be invested yearly in each case. See Table 3.

TABLE 3. Operating Expense Comparisons

Soil Zone	Cult Ac*	Low Input		Soil Saver	
		Crop Ac	$/yr	Crop Ac	$/yr
Black	1,200	600	60,700	1,200	108,300
D. Brown	1,500	750	68,000	1,500	107,400
Brown	1,800	900	72,300	1,800	126,600

* Assume medium Soils and Yields based on Table 1.

NOTE: Farm sizes selected in order to reach similar capital investment on a per farm basis.

In order to understand the reaction of the individual farm decision maker to yield variability, it is necessary to understand the "higher stakes" of the game, as illustrated by the data in Table 3. For farms of the given sizes in all three soil zones, the total of operating capital needed is about $50,000 higher for the soil saver system as opposed to the low input system. Therefore, the increased variability estimated in Table 2 is a more serious deterrent when considered along with the higher operating capital requirements.

4.2 Cost Analysis

The benchmark data developed for this project provides the basis for cost of production comparisons. This section contains a review of the important results. (See Appendix B and C for detailed comparisons).

The total operating costs on a per unit of output basis are very similar for the low input system for all soil zones. However, the cost per bushel produced under the soil saver system is significantly lower for the Black than for the Brown Soil Zones. See Table 4.

From Table 4, it is clear that the lowest operating cost per bushel is achieved with the low input system in all soil zones. The advantages are $.67/bu for the Brown, $.42/bu for the D. Brown, and $.29/bu for the Black.

For a total cost analysis, assumptions must be made regarding the level of family living, debt service and depreciation. For simplicity it is assumed that the total cash outlay for fixed cost is $50,000/year for both systems for all soil zones. When this fixed cost is included, the cost advantage of the low input system is eroded because of the "volume effect" under the soil saver system. From Table 4 it can be seen that there is only a $.15/bu advantage for the low input

TABLE 4: Cash Outlays for Benchmark Farms

	Brown Soil Zone		D. Brown Soil Zone		Black Soil Zone	
	Low Input	Soil Saver	Low Input	Soil Saver	Low Input	Soil Saver
Operating Cost/bu	$2.68	$3.35	$2.59	$3.01	$2.53	$2.82
Fixed Cost/bu*	1.94	1.42	2.00	1.36	2.14	1.36
Total Cash Outlay	4.62	4.77	4.59	4.37	4.67	4.18
Yields: bu/ac	30	21	35	26	40	32
Acres of Crop:	900	1,800	750	1,500	600	1,200
Bushels Produced:	27,000	37,800	26,300	39,000	24,000	38,400

* Fixed Costs include $25,000/yr. family living and $25,000/yr. debt service (P + I)

Low Input System: high tillage system - 1/2 smf.
Soil Saver System: low tillage system - no summerfallow

system in the Brown, while there is a $.22/bu and a $.51/bu advantage for the soil saver system in the D. Brown and Black soil zones respectively.

The results of this analysis show that the new technology associated with Soil Saver systems has definite cost advantages for the Black Soil Zone, because bushels can be produced at lower cost when total costs are considered. The advantage is not very significant for the D. Brown Soil Zone when all costs are considered and therefore any economic advantages would have to be associated with the higher sales volume. For the Brown Soil Zone, the volume effect does not make the soil saver system cheaper based on total cost/bu produced.

To complete this analysis, the higher operating capital level required for Soil Saver systems must be considered. If the additional operating capital identified in Table 3 can be costed in at 10%, this would have the effect of raising the Fixed Cost/bu by about $.14/bu for all three soil zones. When this cost is included, the comparisons based on total cost/bu are as follows:

Brown - low input advantage of $.29/bu
D. Brown - soil saver advantage of $.08/bu
Black - soil saver advantage of $.37/bu

4.3 Net Cash Flow

The net cash flow characteristics of each system are summarized in Table 5. Note that cash flow losses occur in all cases in low price ranges. The losses are significantly higher for the soil saver system in all cases when prices are $3/bu. When prices are at $5/bu, the net cash flow advantage is in favour of the high input soil saver system in all soil zones.

It is important to note that the results presented in Table 5 are based on important assumptions in addition to yields and operating costs. The combinations of farm size and fixed costs are arbitrary. Lower fixed costs due to less debt or a lower requirement for family living would result in a "breakeven" on total costs at lower prices. High acreages would also result in a "breakeven" on total costs at lower prices. On the other hand, if fixed costs were more or acreages were lower, the "breakeven" on total costs would occur at higher prices.

It is clear that price uncertainty is a reason for slow adoption of soil saver systems in Western Canada. It is clear from Table 5 that if there is significantly less production uncertainty with the traditional low input system, then the overall incentive to change to a soil saver system will not be very strong for any soil zones for farms of these acreages and at these fixed cost levels. The "changeover decision" would need to

TABLE 5: Net Cash Position for Benchmark Farms

	Brown Soil Zone		D. Brown Soil Zone		Black Soil Zone	
Costs*	Low Input	Soil Saver	Low Input	Soil Saver	Low Input	Soil Saver
Operating	$ 61,000	$108,000	$ 68,000	$117,000	$ 72,000	$127,000
Fixed	50,000	55,000	50,000	55,000	50,000	55,000
TOTALS	$111,000	$163,000	$118,000	$172,000	$122,000	$182,000
Net Cash Position at Price/bu						
$3	(30,000)	(50,000)	(39,000)	(55,000)	(50,000)	(67,000)
$4	(3,000)	(12,000)	(13,000)	(16,000)	(26,000)	(28,000)
$5	24,000	26,000	13,000	23,000	(2,000	10,000)
Yield:	30	21	35	26	40	32
Acres of crop:	900	1,800	750	1,500	600	1,200

* Fixed Costs include +10% for Soil Saver to reflect higher level of operating capital required.

be based on expectations for yield variability, price trends, and the farm family's subjective reaction to financial risk.

4.4 High Energy Inputs

Unlike the results of the overall cash flow comparisons, the implications for the use of high energy inputs are clear. On a per bushel basis, the expenditures on high energy inputs are generally about twice as high under the soil saver system.

Although fuel costs will be 60 - 70% of the per bushel costs under the high tillage traditional system, fertilizer plus chemical costs are 75 - 80% under the soil saver system. Fertilizer costs are much higher because they are necessary to achieve the high water use efficiency and high yield targets set for the soil saver system. Chemical costs are 3-4 times higher on a per bushel basis under the soil saver system.

When these costs are expressed on a per farm basis, these differences are clearly significant. See Table 7.

From Tables 6 and 7 it is clear that farms operating under the soil saver system must spend about 3 times as much on high energy inputs as those under the high tillage traditional half summerfallow system. Farms using the soil saver system are clearly more vulnerable to increases in the cost of these inputs.

TABLE 6: Level of High Energy Inputs

Input*	Brown Soil Zone		D. Brown Soil Zone		Black Soil Zone	
	Low Input	Soil Saver	Low Input	Soil Saver	Low Input	Soil Saver
	$/bu		$/bu		$/bu	
N Fertilizer	0.0	.68	0.0	.62	0.0	.62
P Fertilizer	.14	.31	.15	.24	.15	.23
Chemical	.14	.56	.15	.49	.15	.46
Fuel	.56	.41	.54	.37	.52	.33
Power	.04	.05	.06	.06	.07	.07
	.88	2.01	.90	1.78	.90	1.71
Yields bu/ac:	30	21	35	26	40	32

* Based on the expectation that the low input system has a high tillage component associated with low fertilizer and chemical costs. Conversely, the Soil Saver System has a low tillage component and high fertilizer and chemical costs.

TABLE 7: Expenditures on High Energy Inputs

Cost of High Energy Inputs	Brown Soil Zone		D. Brown Soil Zone		Black Soil Zone	
	Low Input	Soil Saver	Low Input	Soil Saver	Low Input	Soil Saver
Fertilizer	$ 3,800	$37,400	$ 3,900	$33,000	$ 3,600	$32,600
Chemicals	3,800	21,200	3,900	19,100	3,600	17,600
Fuel	15,000	15,500	14,000	14,400	12,500	12,700
Power	1,100	1,900	1,600	2,300	1,700	2,700
TOTALS	$23,700	$76,000	$23,400	$69,300	$21,400	$65,600
Yields:	30	21	35	26	40	32
Acres in Crop:	900	1,800	750	1,500	600	1,200

NOTE: Based on per bushel costs given in Table 6.

From another perspective, using high energy inputs efficiently is a more crucial management objective for soil saver farms.

4.5 Farmer's Reactions

The reactions of farmers to the Analyzer program were varied and appeared to depend on the individual's familiarity with computers. Those who do not have a computer are usually intimidated to some degree by the electronic process, and their interest is limited to an initial curiosity. Those who have computers were impressed with the menu type program (as compared to the usual spread sheet procedures they use themselves) and with the graphic outputs associated with the program.

Throughout the demonstration period, farmers tended to focus on the problems of low prices and were eager to find reasons to justify cutting operating costs. For this reason, the reaction to the possibility of changeover to the soil saver system was repeatedly very cool. On the other hand, several farmers who are on a continuous crop system (or close to it), reacted in terms of the difficulty of changing back to systems with more summerfallow. These farmers described the "locked in" nature of soil saver systems as a disadvantage.

The typical response of farmers in all soil zones to the analysis based on benchmark data was that if prices were in the

$5-$6 range, the soil saver system would be the preferred system in all counts. However, several farmers questioned whether the high yield targets were feasible for soil saver systems in their area. This reaction was typical of farmers in the Brown and D. Brown Soil Zones where stubble yield targets were set at 70% and 74% of summerfallow yield targets respectively. If stubble yields do not reach these levels, prices must be more than $5-$6 to make the soil saver system comparable in terms of cash flow.

These concerns about yield possibilities and prices tended to overshadow concerns about costs of production and the requirements for operating capital. However, when farmers were able to analyze their own farm, they were able to focus on costs more readily.

One interesting type of reaction deserves additional comment. Farmers generally reacted in a negative way to the chemical costs and spraying requirements of the soil saver system. The reaction was as much to the high level of use (i.e. the time requirement for spraying) as to the high level of costs. Clearly some farmers chose to stay with summerfallow intensive systems because they want to avoid the high level of chemical use associated with soil saver systems.

The farmers who were exposed to the Analyzer program did not appear to be concerned about loss of fertility due to leaching or

"mining" of soil nutrients under low input systems. This appears to be due partly to a lack of data showing how much fertility is actually being lost due to traditional systems and whether the loss is actually hurting production on their farm. This general reaction also reflects the current focus on low grain prices and the consequent "survival mode" farm planning in the face of capital rationing for inputs.

5.0 CONCLUSIONS

1. Recent research and demonstration results show that conservation farming systems designed to save soils compare favorably to traditional summerfallow systems, although the comparative cash flow characteristics are sensitive to price.

2. The analysis based on the benchmark data revealed that operating costs per bushel are 11-25% for soil saver systems. However, the total amount of operating capital required is 56-77% higher on a per year per farm basis.

3. In the short term, capital rationing can force management decisions toward traditional systems, even though differences in total cost per unit of output do not support such a move. This pressure is very strong in all soil zones when prices are in the $3-4 range.

4. In the long term, total costs will be in favour of the soil saver system, especially for the Black Soil Zone and in cases where field costs are very high. The "volume effect" can make the soil saver more efficient in terms of total cost/unit of output when fixed costs are spread over more bushels.

5. At prices in the $5 range, short term capital rationing should not be a problem and the soil saver system can result in a better net cash flow for all 3 soil zones.

6. The management decision regarding traditional vs. soil saver systems is unique to each farm situation. There are three main areas of concern and uncertainty which the decision maker must resolve. These are:

   (1) Uncertainty about stubble yield potential in relation to summerfallow yields and differences in variability around expected averages;
   (2) How to finance the high operating capital requirements under the soil saver system due to high expenditures on fertilizer, and chemicals and other inputs;
   (3) Uncertainty about price/cost relationships over time, especially regarding trends to low price scenarios which may mean that operating costs per bushel might be greater than the price under the soil saver system.

7. The mix of high energy inputs is very different for the two systems. Fuel costs per unit of output are lower for the soil saver system by 25-35%, but fertilizer costs are 6-7 times higher on a per unit of output basis. Chemical costs are 3-4 times higher.

8. The traditional summerfallow intensive systems are more efficient in the use of energy intensive inputs.

9. There is a clear conflict between conservation of soils in the long term conservation of high energy inputs. The cost of soil conservation through soil saver systems can be expressed in terms of loss in input/output efficiency of in the use of high energy inputs in the short term.

10. During periods of low prices, farmers identify capital rationing for operating costs as a major deterrent for crop intensive soil saver systems, even though they recognize long term cash flow advantages associated with soil saver systems for their farm.

APPENDIX A

PROGRAM SPECIFICATION

AND SAMPLE

SESSION

CROPPING STRATEGY CASH FLOW ANALYZER

An IBM PC Program For The
Assessment of Farm Management Strategies

PROGRAM SPECIFICATION

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PURPOSE OF THE PROGRAM

1. The **Cropping Strategy Cash Flow Analyzer** is an analytical tool for use by agricultural economists in the assessment of alternative cropping strategies.

2. Although the **Cropping Strategy Cash Flow Analyzer** actually consists of two micro computer programs, in this document references to "the program" are aimed at the main Analyzer program. The Data Entry program is a subordinate component which is used to maintain a data file that functions as input to the main program.

   The Data Entry program is used to create and edit a file containing a set of average input data for each possible combination of cropping strategy, soil zone and land productivity. This data file and additional user inputs are used by the **Cropping Strategy Cash Flow Analyzer** to generate a cash flow projection for a specified period of years.

3. The program projects annual cash flows for two alternative cropping strategies:

   - continuous cropping (Soil saver system)
   - alternative year cropping (Low input system)

4. The program produces a hard copy output containing:

   a. a record of the input data

   b. annual figures for production, revenue, cash outlay, surplus (or deficit), and grain in storage for each year in the projection

   c. accumulated figures for the sequence of years in the projection

   d. cash flow per acre and per bushel sold

   e. bar charts, highlighting the results

PROGRAM SCOPE

The program is basically a means of projecting cash flows over a specified number of years of farm operation.

A number of features are included in the program to model real life factors, such as:

1. Random yields within a user specified range
2. Retention of seed grain
3. Storage of grain
4. Discount selling of excess grain
5. Crop insurance
6. Variable fertilizer costs (as a function of previous year's yield) for continuously cropped farms (Soil saver system)
7. Variable fuel and repair costs (as a function of yields)
8. Family living costs
9. Debt service payments of principal and interest
10. Computation of the annual surplus (deficit) available for replacement of machinery, etc.
11. Soil zone determined by the user's R.M. number (Black, Dark Brown, Brown)
12. Land productivity (Light, Medium, Heavy)
13. Range of grain prices (quota price and quota price $\pm$ $1.00)
14. Inflation trend (+ or -)
15. Grain price trend (+ or -)
16. Optional inclusion of nitrogen loss from fallow land in the Low input system

Mandatory Inputs

The user is required to supply the program with the following data:

CROPPING STRATEGY	Low input, Soil saver
LAND PRODUCTIVITY	Light, Medium, Heavy
R.M. NUMBER	
NAME	Last, First
CULTIVATED ACRES	Acres
QUOTA ACRES	Acres
QUOTA	Bu/Acre
QUOTA PRICE	$/Bu
CROP INSURANCE THRESHOLD	Bu/Acre
DISCOUNT RATE	Percent
GRAIN IN STORAGE	Bushels
CARRY OVER STORAGE LIMIT	Bushels
LIVING EXPENSE	$/Year
DEBT SERVICE	$/Year
INFLATION RATE	Percent (+ or -)
GRAIN PRICE TREND	Percent (+ or -)
YIELD LAST YEAR	Bu/Acre
NUMBER OF YEARS IN PROJECTION	

Optional Inputs

The user has the option of using the supplied data or changing the values for the following items:

YIELD LOWER LIMIT	Bu/Acre
YIELD UPPER LIMIT	Bu/Acre
NITROGEN FERTILIZER	$/Crop Acre
PHOSPHORUS FERTILIZER	$/Crop Acre
CHEMICALS	$/Crop Acre
FUEL	$/Cult Acre
INSURANCE	$/Cult Acre
REPAIR	$/Cult Acre
R.M. TAXES	$/Cult Acre
POWER	$/Cult Acre
CUSTOM WORK	$/Cult Acre
OTHER	$/Cult Acre
NITROGEN LOSS	$/Fallow Acre
RANDOM NUMBER SEED	0 to 32767

CALCULATIONS

1. The program is capable of analyzing two systems:

   a. Soil saver farm, where the land is continuously cropped

   b. Low input farm, where half the land is cropped in any given year

   The user has the capability of selecting either option.

2. The soil zone, which is used with the cropping strategy and land productivity choices to select a record from the input data file, is determined from the R.M. number that the user enters. All of the Rural Municipalities in the province of Saskatchewan were separated into three soil zones: Black, Dark Brown and Brown.

   The Rural Municipalities which are included in the Black soil zone are:

1	31	32	61	63	91
92	93	94	121	122	123
124	125	151	152	153	154
155	156	181	183	184	185
186	187	211	213	214	215
216	217	218	241	243	244
245	246	247	248	271	273
274	275	276	277	278	301
303	304	305	307	308	331
333	334	335	336	337	338
339	340	366	367	368	369
370	376	377	395	396	397
399	400	401	402	403	404
406	408	426	427	428	429
430	431	434	435	436	437
438	439	440	442	456	457
458	459	460	461	463	464
466	467	468	469	470	471
472	486	487	488	490	491
493	494	496	497	498	499
501	502	504	529	944	959
960	974	980	983	989	

The Rural Municipalities which are included in the Dark Brown soil zone are:

2	3	4	5	6	7
33	34	35	36	37	64
65	66	67	68	95	96
97	98	99	126	127	128
129	157	158	159	160	161
189	190	191	219	220	221
222	250	251	252	253	254
279	280	281	282	283	284
285	286	287	309	310	312
313	314	315	316	317	318
341	342	343	344	345	346
347	349	350	351	371	372
373	378	379	380	381	382
409	410	411			

The Rural Municipalities which are included in the Brown soil zone are:

8	9	10	11	12	17
18	19	38	39	40	42
43	44	45	46	49	51
69	70	71	72	73	74
75	76	77	78	79	100
101	102	103	104	105	106
107	108	110	111	130	131
132	133	134	135	136	137
138	139	141	142	162	163
164	165	166	167	168	169
171	193	194	223	224	225
226	228	229	230	231	232
255	256	257	259	260	261
288	290	292	319	320	321
322	352	929	932		

3. Two methods of determining crop yields are provided:

   a. Yields selected at random from a uniform distribution, whose limits are input by the user

   b. Yields determined by the user and input to the calculation by setting the upper and lower yield limits to the same specified value

   The user has the capability of specifying either option.

4. Annual production is determined as follows:

   Production (Bushels) = Yield (Bu/Acre) X Crop Acres
   where: Crop Acres = Cultivated Acres (Soil saver)
   = 0.5 X Cultivated Acres (Low input)

5. Seed, in the amount of 1.5 bushels per crop acre, is subtracted from production to determine the amount of grain available for sale or storage.

6. Revenue is determined as follows:

   a. The maximum allowable amount of grain available is sold on quota at the quota price (see the following point). If production is insufficient to meet the quota then grain is sold from the farm storage bins (providing there is grain in storage).

   b. In all calcuations, the Quota Price in year n of the projection is:

      Quota Price(n) = Quota Price(1) X (1 + Grain Price Trend/100)

   c. If all of the grain produced cannot be sold on quota, then it is placed in storage. If there is still grain remaining after the quota has been filled and the storage bins are full, then the remainder is sold at a discount price.

   d. If the yield is lower than the crop insurance threshold, then the crop insurance claim generates revenue in the amount of:

      (Threshold - Yield) X Crop Acres X Quota Price X Discount Rate / 100

7. Cash outlay is determined as follows:

   a. Expenses which are a function of Crop Acres comprising fertilizer (Nitrogen and Phosphorus) and Chemical costs.

      The program uses input values corresponding to the target yield. For the Soil saver farm only, Nitrogen fertilizer costs are scaled by the following relation when last year's yield is greater than the target yield:

      1 + ((YIELD LAST YEAR - TARGET YIELD) / TARGET YIELD)

      If using a yield range, the target yield equals the median value, else it equals the value specified by the user. If last year's yield is less than or equal to the target yield for a Soil saver farm, the Nitrogen fertilizer cost is scaled by 1 (as it is for the Low input farm).

   b. Expenses which are a function of Cultivated Acres comprising Fuel and Repair costs.

The input values for Fuel and Repairs (corresponding to target yields) are scaled by the following relation:

1 + (0.3 X ((THIS YEAR'S YIELD - TARGET YIELD) / TARGET YIELD))

c. Miscellaneous operating costs, comprising all cost categories not included in (a) and (b).

   The input values, corresponding to the target yield, are used as entered.

d. Except for debt service, the value of which remains equal to the input value throughout the projection period, the value of all inputs in year (n) are:

   Input Value(n) = Input Value(1) X (1 + Inflation Rate)

8. An annual Surplus or Deficit, being equal to Total Revenue less Total Cash Outlay, is computed. A deficit figure is indicated by a minus sign. If the effect of nitrogen leaching was selected for inclusion in the study, its cost and an adjusted surplus or deficit is computed.

9. The amount of grain remaining in storage at the end of each year is computed.

10. During the course of these annual calculations, accumulating sums for Production, Revenue items and Cash Outlay items are maintained. Average revenues and costs per acre and per bushel sold, as well as the mean annual values of revenues and costs over the forecast period, are also computed.

11. The expected annual yield variance is determined as follows:

$$\frac{\sum_{n=1}^{n = \text{Number of years in projection}} \left| \text{YIELD in Year } n - \text{AVERAGE YIELD} \right|}{n}$$

Printed Output

1. The program prints all input data:

CROPPING STRATEGY	Low input, Soil saver
LAND PRODUCTIVITY	Light, Medium, Heavy
R.M. NUMBER	
NAME	Last, First
CULTIVATED ACRES	Acres
QUOTA ACRES	Acres
QUOTA	Bu/Acre
QUOTA PRICE	$/Bu
CROP INSURANCE THRESHOLD	Bu/Acre
DISCOUNT RATE	Percent
GRAIN IN STORAGE	Bushels
CARRY OVER STORAGE LIMIT	Bushels
LIVING EXPENSE	$/Year
DEBT SERVICE	$/Year
INFLATION RATE	Percent
GRAIN PRICE TREND	Percent
YIELD LAST YEAR	Bu/Acre
NUMBER OF YEARS IN PROJECTION	
YIELD LOWER LIMIT	Bu/Acre
YIELD UPPER LIMIT	Bu/Acre
NITROGEN FERTILIZER	$/Crop Acre
PHOSPHORUS FERTILIZER	$/Crop Acre
CHEMICALS	$/Crop Acre
FUEL	$/Cult Acre
INSURANCE	$/Cult Acre
REPAIR	$/Cult Acre
R.M. TAXES	$/Cult Acre
POWER	$/Cult Acre
CUSTOM WORK	$/Cult Acre
OTHER	$/Cult Acre
NITROGEN LOSS	$/Fallow Acre
RANDOM NUMBER SEED	0 to 32767

In addition, a narrative summary of the inputs selected is printed.

2. For each year in the projection the following data is output:

YEAR

PRODUCTION
- Bushels/Acre
- Bushels

REVENUE
- Quota Sales
- Discount Sales
- Insurance Claims Received
- Total Revenue

CASH OUTLAY
- Nitrogen Fertilizer
- Phosphorus Fertilizer
- Chemicals
- Fuel
- Insurance
- Repairs
- R.M. Taxes
- Power
- Custom Work
- Other
- Living Expenses
- Debt Service
- Total Cash Outlay

SURPLUS / DEFICIT
- Accumulated Surplus / Deficit

OPTIONAL
- Nitrogen Loss
- Adjusted Surplus / Deficit

GRAIN IN STORAGE

3. The program prints an accumulated total and mean annual value for the items which are output for each year in the projection (except for the yield). Average cash flows over the forecast period per acre and per bushel sold are also printed, except for the Production items.

4. Also printed are:

   a. Yield Summary

   b. Surplus / Deficit as a function of grain price

   c. Summary of selected costs

   d. Cash Flow Summary

5. The following bar charts are printed on request:

   a. Annual Yields (Bushel/Acre)

   b. Breakeven Grain Prices by Year ($/Bushel)

   c. Selected Inputs (Average $/Bushel over forecast period)

   d. Accumulated Cash Flow ($) as a function of grain price ($/Bushel)

1. This program was written for an IBM PC with an Epson FX-100 printer, a monochrome display and a graphics display. It was written in Advanced BASIC (Version 2.00) and compiled using the IBM PC BASIC Compiler (Version 1.00). The main program cannot be run using the BASIC interpreter as it exceeds the memory restrictions (64 K) for BASIC.

2. The specific hardware requirements are as follows:

   - **IBM PC with:**
     - DOS 2.0
     - minimum 192K RAM
     - one floppy disk drive
     - monochrome/parallel printer card
     - color/graphics card
   - **monochrome monitor**
   - **black and white graphics monitor**
   - **EPSON FX-100 printer**

3. The four program files listed below should be copied on to a system diskette (a diskette containing the operating system). The file names are:

Data Entry Program	**DATASET.EXE**
Data Set File	**CROPDATA.SET**
Cash Flow Analyzer	**ANALYZER.EXE**
	BARVIEW.EXE

   The latter programs chain each other.

4. If sufficient RAM is present, the two **Cash Flow Analyzer** programs and the Data Set file can be loaded on to a RAM disk and executed from there. This eliminates the delay in alternately reading the two parts of the program into memory from the diskette.

5. A print spooler minimizes time spent waiting for the printer to complete printing of reports and graphs.

DELIVERABLE ITEMS

The following items were generated in the course of the program development and were delivered upon completion:

- Program Specification
- User's Manual (including sample sessions)
- Program Listing for Each Program
- Copy of the Programs on Floppy Diskette

18 , 19, 20,

1. To start the Cropping Strategy Cash Flow Analyzer Data Entry program, type **DATASET** following the **A>** (DOS prompt).

   A> DATASET

   Then press the **Enter** key. The light on diskette drive A will come on as the program is loaded.

2. The Data Entry Options Menu, illustrated in Figure 19, will be displayed on the monochrome monitor when the program has been loaded.

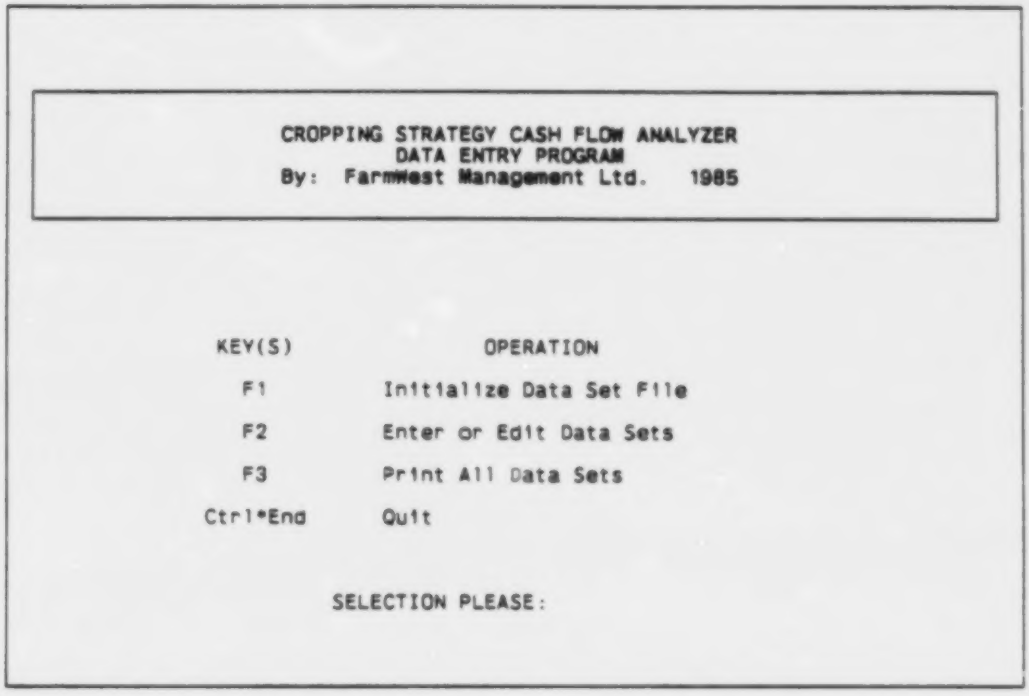

Figure 19. Data Entry Options Menu Screen

This Menu Screen displays a list of operations to choose from:

a. The **Initialize Data Set File** operation is usually only done when the program is executed for the first time. It creates a data file of eighteen records and initializes all of the fields to zero. If a Data Set file already exists, all of the data in it is destroyed. To protect against accidental deletion of the data file, you are asked to confirm this operation before it is actually carried out.

b. The **Enter or Edit Data Sets** operation allows you to enter new data into the data file or to change the existing data. New data

is being entered when the Data Entry Screen shows the fields with initial zero values. This is the operation which will be used most often.

c. The **Print All Data Sets** operation produces a printout or hard copy, on wide paper, of all the data in the Data Set file. The information is printed in a one page report.

d. The **Quit** operation terminates execution of the Data Entry program, closes the data file and returns control to DOS (the operating system).

3. A selection is made from the Data Entry Options Menu by pressing one of the three function keys: **F1**, **F2**, or **F3**; or by pressing the two keys in the special key combination simultaneously: **Ctrl** and **End**.

4. An example of the Data Entry Screen (selected by pressing **F2**) is shown in Figure 20. This is the appearance of the screen before new data is entered. The line at the bottom of the screen is constantly displayed as a reference. Information that you have typed in a data field is not entered into the computer until the **Enter** key has been pressed.

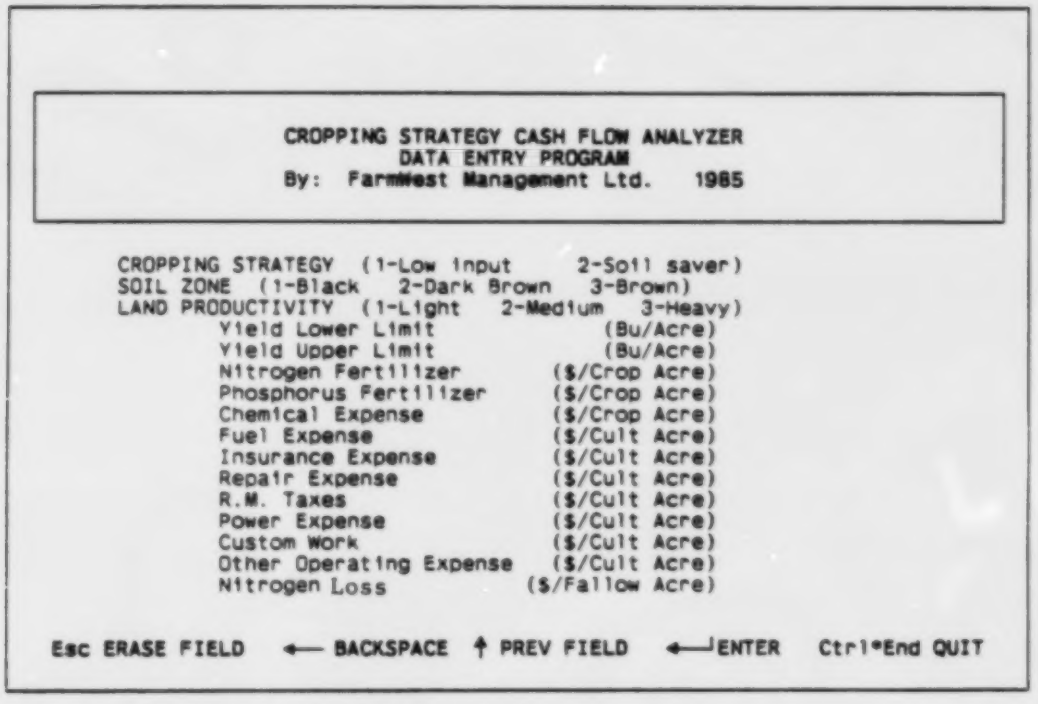
CROPPING STRATEGY CASH FLOW ANALYZER
DATA ENTRY PROGRAM
By: FarmWest Management Ltd. 1985
CROPPING STRATEGY (1-Low Input 2-Soil saver)
SOIL ZONE (1-Black 2-Dark Brown 3-Brown)
LAND PRODUCTIVITY (1-Light 2-Medium 3-Heavy)
Yield Lower Limit (Bu/Acre)
Yield Upper Limit (Bu/Acre)
Nitrogen Fertilizer ($/Crop Acre)
Phosphorus Fertilizer ($/Crop Acre)
Chemical Expense ($/Crop Acre)
Fuel Expense ($/Cult Acre)
Insurance Expense ($/Cult Acre)
Repair Expense ($/Cult Acre)
R.M. Taxes ($/Cult Acre)
Power Expense ($/Cult Acre)
Custom Work ($/Cult Acre)
Other Operating Expense ($/Cult Acre)
Nitrogen Loss ($/Fallow Acre)
Esc ERASE FIELD ← BACKSPACE ↑ PREV FIELD ↵ ENTER Ctrl*End QUIT

Figure 20. Initial Data Entry Screen

The special key combination **Ctrl*End** will return you to the Selection Menu, allowing you to choose another operation.

The **Backspace** key and the **Esc** key allow you to correct typing errors within the current data field. The current field is indicated by the location of the cursor.

The **Previous Field** key and the **Enter** key allow you to move to the previous field or to the next field respectively. These keys are used to correct typing mistakes or to bypass fields where no change needs to be entered.

5. Figure 21 shows a Data Entry Screen where the maximum allowable value is entered in each data field.

```
                CROPPING STRATEGY CASH FLOW ANALYZER
                      DATA ENTRY PROGRAM
                By:  FarmWest Management Ltd.   1985

CROPPING STRATEGY  (1-Low input     2-Soil saver)        2
SOIL ZONE  (1-Black   2-Dark Brown   3-Brown)            3
LAND PRODUCTIVITY  (1-Light   2-Medium   3-Heavy)       3
        Yield Lower Limit                (Bu/Acre)      99
        Yield Upper Limit                (Bu/Acre)     999
        Nitrogen Fertilizer        ($/Crop Acre)      99.99
        Phosphorus Fertilizer      ($/Crop Acre)      99.99
        Chemical Expense           ($/Crop Acre)      99.99
        Fuel Expense               ($/Cult Acre)      99.99
        Insurance Expense          ($/Cult Acre)      99.99
        Repair Expense             ($/Cult Acre)      99.99
        R.M. Taxes                 ($/Cult Acre)      99.99
        Power Expense              ($/Cult Acre)      99.99
        Custom Work                ($/Cult Acre)      99.99
        Other Operating Expense    ($/Cult Acre)      99.99
        Nitrogen Loss            ($/Fallow Acre)      99.99
                WRITE RECORD TO FILE?   (Y or N)

Esc ERASE FIELD   <-- BACKSPACE   ↑ PREV FIELD   <-┘ ENTER   Ctrl-End QUIT
```

Figure 21. Maximum Values for the Data Entry Screen

6. A sample Data Entry Program session is shown in Appendix B.

1. To start the Cropping Strategy Cash Flow Analyzer program, type **ANALYZER** following the **A>** (DOS prompt).

   A> ANALYZER

   Then press the **Enter** key. The light on diskette drive A will come on as the program is loaded.

2. When the program is loaded, the first OPTIONS MENU is displayed as shown in Figure 22. Press **F1** if you wish to include nitrogen leaching losses in the calculations. To exclude them, Press **F2**. Press **Ctrl*End** (Ctrl and End keys simultaneously) to terminate the program and return to the operating system (DOS).

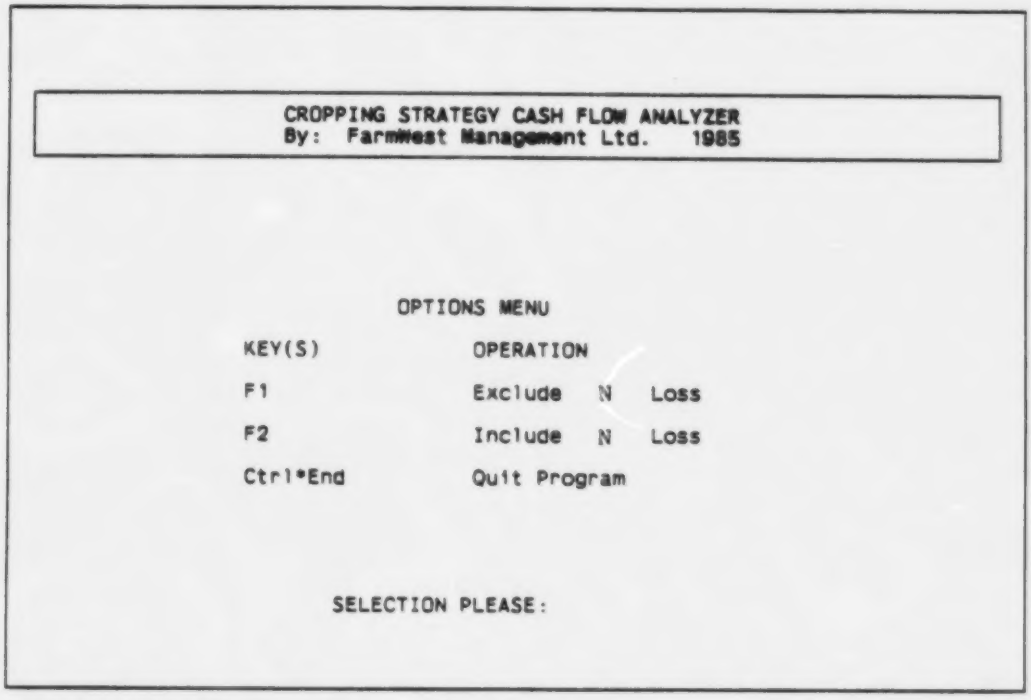

Figure 22. First OPTIONS MENU Screen

3. After pressing **F1** or **F2**, the second OPTIONS MENU is displayed as shown in Figure 23 on page 26. Press **F1** if you wish to do a comparative study (comparing a Low input {crop-fallow} system with a Soil saver {continuous cropping} system). To study a single system (Low input or Soil saver), press **F2**. To return to the previous (first) OPTIONS MENU, press **Ctrl*End**.

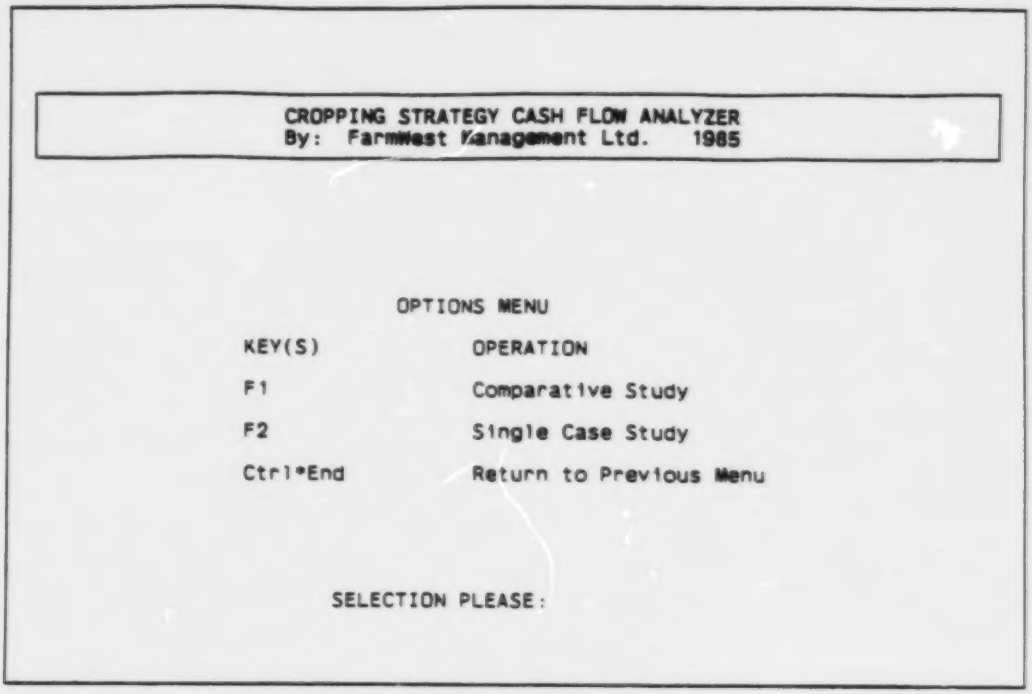

Figure 23. Second OPTIONS MENU Screen

4. After pressing F1 or F2 the Mandatory Input Screen will be displayed on the monochrome monitor. Figure 24 on page 27 shows the Mandatory Input Screen as it will appear for the first projection in a session. Each subsequent projection will display this screen with data from the preceding run entered in the fields. The line at the bottom of the screen is constantly displayed as a reference. Changes that have been typed in a data field are not entered into the computer until the Enter key has been pressed.

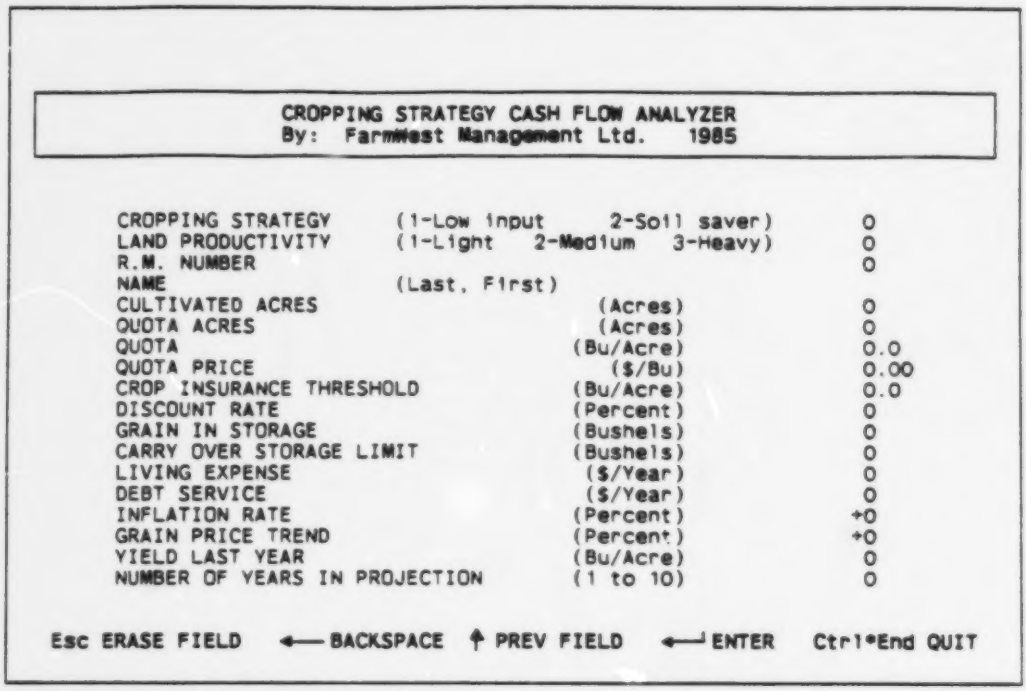
CROPPING STRATEGY CASH FLOW ANALYZER
By: FarmWest Management Ltd. 1985
CROPPING STRATEGY (1-Low input 2-Soil saver) 0
LAND PRODUCTIVITY (1-Light 2-Medium 3-Heavy) 0
R.M. NUMBER 0
NAME (Last, First)
CULTIVATED ACRES (Acres) 0
QUOTA ACRES (Acres) 0
QUOTA (Bu/Acre) 0.0
QUOTA PRICE ($/Bu) 0.00
CROP INSURANCE THRESHOLD (Bu/Acre) 0.0
DISCOUNT RATE (Percent) 0
GRAIN IN STORAGE (Bushels) 0
CARRY OVER STORAGE LIMIT (Bushels) 0
LIVING EXPENSE ($/Year) 0
DEBT SERVICE ($/Year) 0
INFLATION RATE (Percent) +0
GRAIN PRICE TREND (Percent) +0
YIELD LAST YEAR (Bu/Acre) 0
NUMBER OF YEARS IN PROJECTION (1 to 10) 0
Esc ERASE FIELD ← BACKSPACE ↑ PREV FIELD ↵ ENTER Ctrl*End QUIT

Figure 24. Mandatory Input Screen

The special key combination **Ctrl*End** will return you to the OPTIONS MENU. The data files are closed and control is returned to the operating system (DOS).

The **Backspace** key and the **Esc** key allow you to correct typing errors within the current data field (before the **Enter** key has been pressed). The current field is indicated by the location of the cursor.

The **Previous Field** key and the **Enter** key allow you to move to the previous field or to the next field respectively. These keys are used to correct typing mistakes or to bypass fields where no change needs to be entered.

5. Figure 25 on page 28 shows a Mandatory Input Screen where the maximum allowable value is entered in each data field.

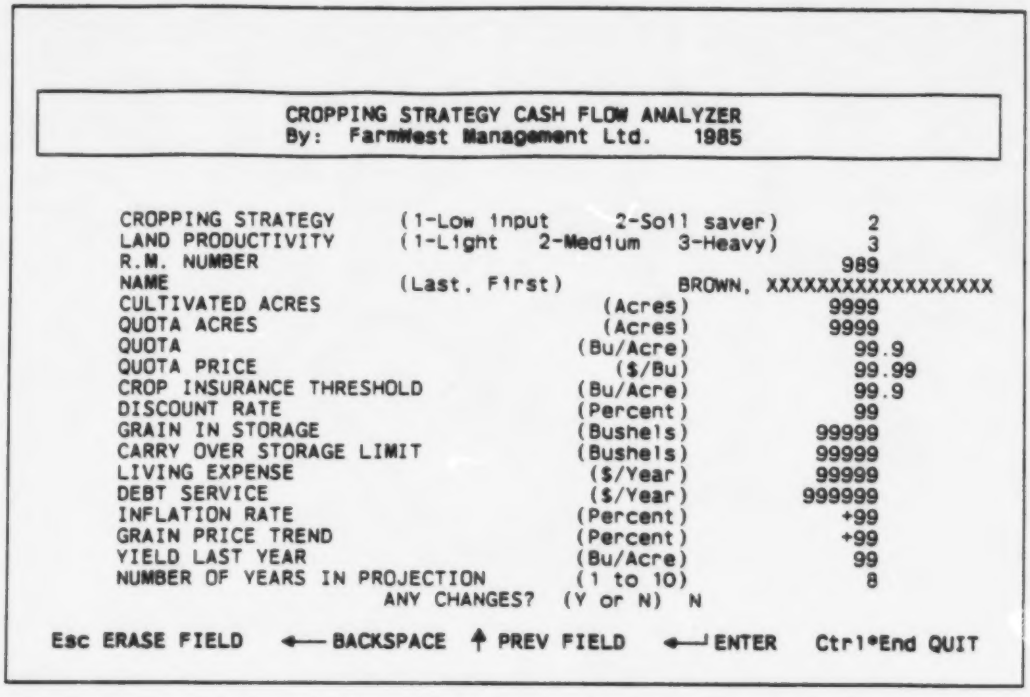
CROPPING STRATEGY CASH FLOW ANALYZER
By: FarmWest Management Ltd. 1985
CROPPING STRATEGY (1-Low Input 2-Soil saver) 2
LAND PRODUCTIVITY (1-Light 2-Medium 3-Heavy) 3
R.M. NUMBER 989
NAME (Last, First) BROWN, XXXXXXXXXXXXXXXXX
CULTIVATED ACRES (Acres) 9999
QUOTA ACRES (Acres) 9999
QUOTA (Bu/Acre) 99.9
QUOTA PRICE ($/Bu) 99.99
CROP INSURANCE THRESHOLD (Bu/Acre) 99.9
DISCOUNT RATE (Percent) 99
GRAIN IN STORAGE (Bushels) 99999
CARRY OVER STORAGE LIMIT (Bushels) 99999
LIVING EXPENSE ($/Year) 99999
DEBT SERVICE ($/Year) 999999
INFLATION RATE (Percent) +99
GRAIN PRICE TREND (Percent) +99
YIELD LAST YEAR (Bu/Acre) 99
NUMBER OF YEARS IN PROJECTION (1 to 10) 8
ANY CHANGES? (Y or N) N
Esc ERASE FIELD ← BACKSPACE ↑ PREV FIELD ↵ ENTER Ctrl*End QUIT

Figure 25. Maximum Values for the Mandatory Input Screen

6. After the Mandatory Input Screen has been entered, the Optional Input Screen is displayed. The data fields on this screen are read from the input data file which was created by the Data Entry program. You can change any fields you wish by typing over the existing data and pressing **Enter**. Alternatively, you can bypass fields which don't require changes by pressing the **Next Field** key. Figure 26 on page 29 shows an Optional Input Screen where the maximum allowable value is entered for each data field.

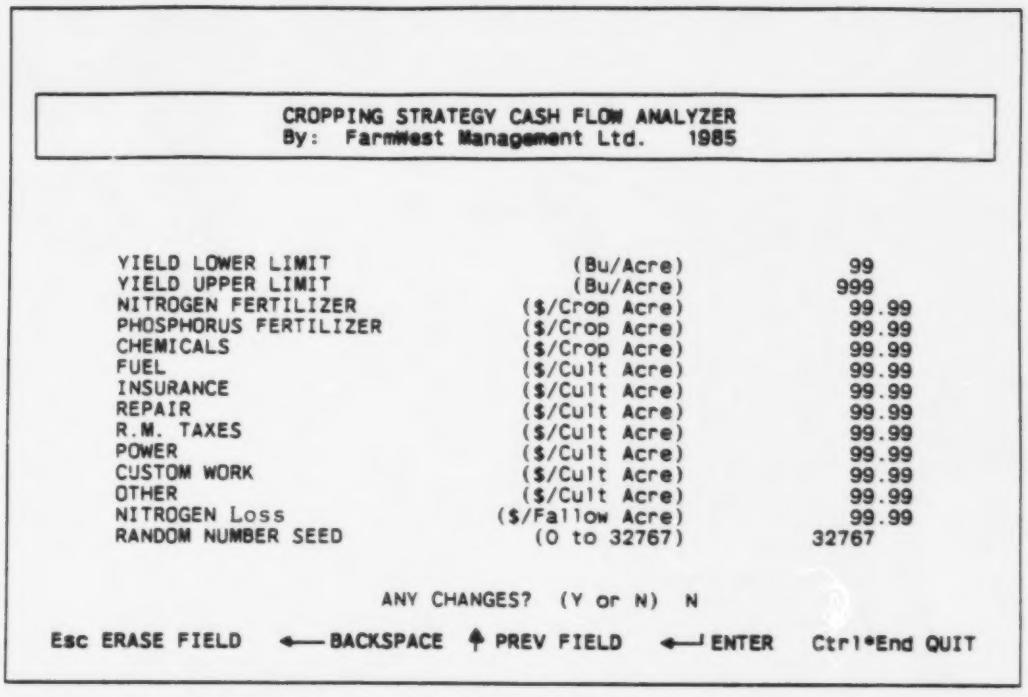
CROPPING STRATEGY CASH FLOW ANALYZER
By: FarmWest Management Ltd. 1985
YIELD LOWER LIMIT (Bu/Acre) 99
YIELD UPPER LIMIT (Bu/Acre) 999
NITROGEN FERTILIZER ($/Crop Acre) 99.99
PHOSPHORUS FERTILIZER ($/Crop Acre) 99.99
CHEMICALS ($/Crop Acre) 99.99
FUEL ($/Cult Acre) 99.99
INSURANCE ($/Cult Acre) 99.99
REPAIR ($/Cult Acre) 99.99
R.M. TAXES ($/Cult Acre) 99.99
POWER ($/Cult Acre) 99.99
CUSTOM WORK ($/Cult Acre) 99.99
OTHER ($/Cult Acre) 99.99
NITROGEN Loss ($/Fallow Acre) 99.99
RANDOM NUMBER SEED (0 to 32767) 32767
ANY CHANGES? (Y or N) N
Esc ERASE FIELD ← BACKSPACE ↑ PREV FIELD ↵ ENTER Ctrl*End QUIT

Figure 26. Maximum Values for the Optional Input Screen

The Random Number Seed is an arbitrary figure that is input to the Random Number Generator to generate random yields. The default value, which is automatically displayed on the screen, is 1017.

7. After the Optional Input Screen is entered, the Cropping Strategy Cash Flow Analyzer prints a hard copy of the input data if you answer Y (Yes) to the question "Print Reports?". The cash flow projection is then generated for each year in the series and calculations are done. On completion of the projection, the results are printed in a one page report unless you selected not to print the reports.

   If you selected the comparative study, the Mandatory and Optional input screens will be presented again to allow you to enter data for the Soil Saver system (strategy 2).

8. You can return to the OPTIONS MENU in the Analyzer program at any time when input is requested, by entering the special key combination: Ctrl*End.

9. On completion of the projection(s), the bar chart program BARVIEW.EXE will automatically be loaded into memory (the disk drive light will come on) and another OPTIONS MENU will be displayed on the monochrome monitor (see Figure 27 on page 30). Pressing one of the function keys, F1 through F4 will display the associated graph on the graphics monitor.

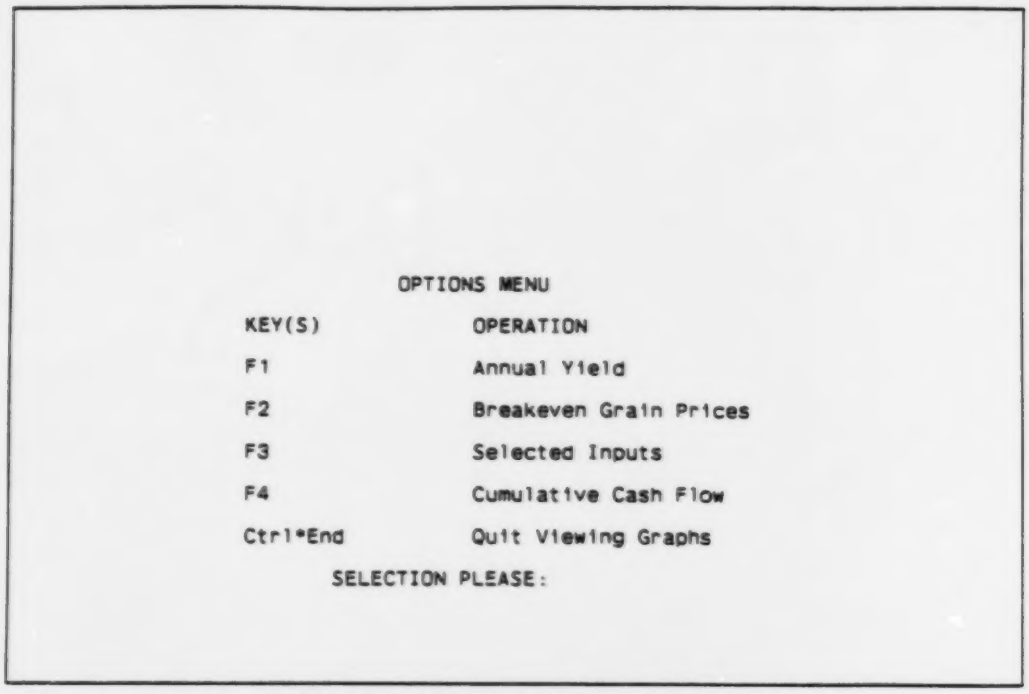

Figure 27. Third OPTIONS MENU Screen

10. In the upper right corner of the graph a small downward pointing triangle will be displayed. This is the **Pointer**. Use the **Grow Pointer** and **Shrink Pointer** keys to change the size of the **Pointer**. Use the **Move Pointer Left** and **Move Pointer Right** keys to position the **Pointer** above the bar you wish to highlight. If this feature appears not to work, press the **Num Lock** once to return the numeric keypad to its normal (lower case) status.

11. When you have finished viewing the graph, press **Ctrl*End**. You will be asked "Print Graph on Printer?". Answer **Y** (Yes) if you want a hard copy of the graph. This will take approximately 90 seconds. Do **not** press **Ctrl*End** while you are waiting for the graph to print. If you wish to see another graph, wait for the menu to reappear. When the graph has been printed, or if you had answered **N** (No) to the question "Print Graph on Printer", the OPTIONS MENU will reappear on the monochrome monitor. Select another graph or press **Ctrl*End** to return to the Analyzer program. The latter will be reloaded into memory from the diskette, so the diskette drive light will come on again.

12. A sample Analyzer program session is shown in Appendix C.

1. Remove the diskette or diskettes as shown in Figure 28.

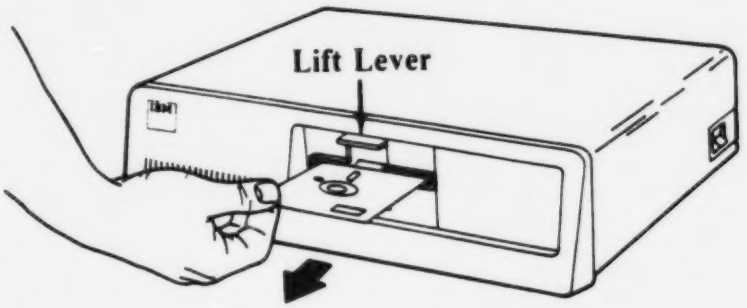

Figure 28. Remove Diskettes

2. Position the power switches to OFF on all units (System Unit, Video Monitor and the Printer. See Appendix A for printer information.

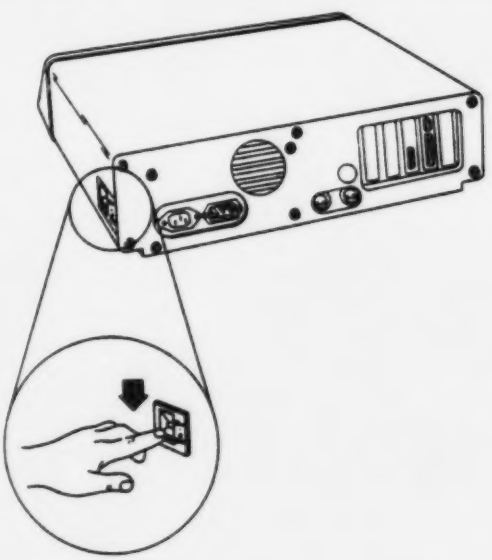

Figure 29. Turn Off System Unit Power

APPENDIX A. GETTING FAMILIAR WITH THE PRINTER

In this Appendix printer operating procedures are covered in sufficient detail for the user to become familiar with the printer. There are three buttons and four indicator lights on the printer control panel and one power switch on the left side of the printer case.

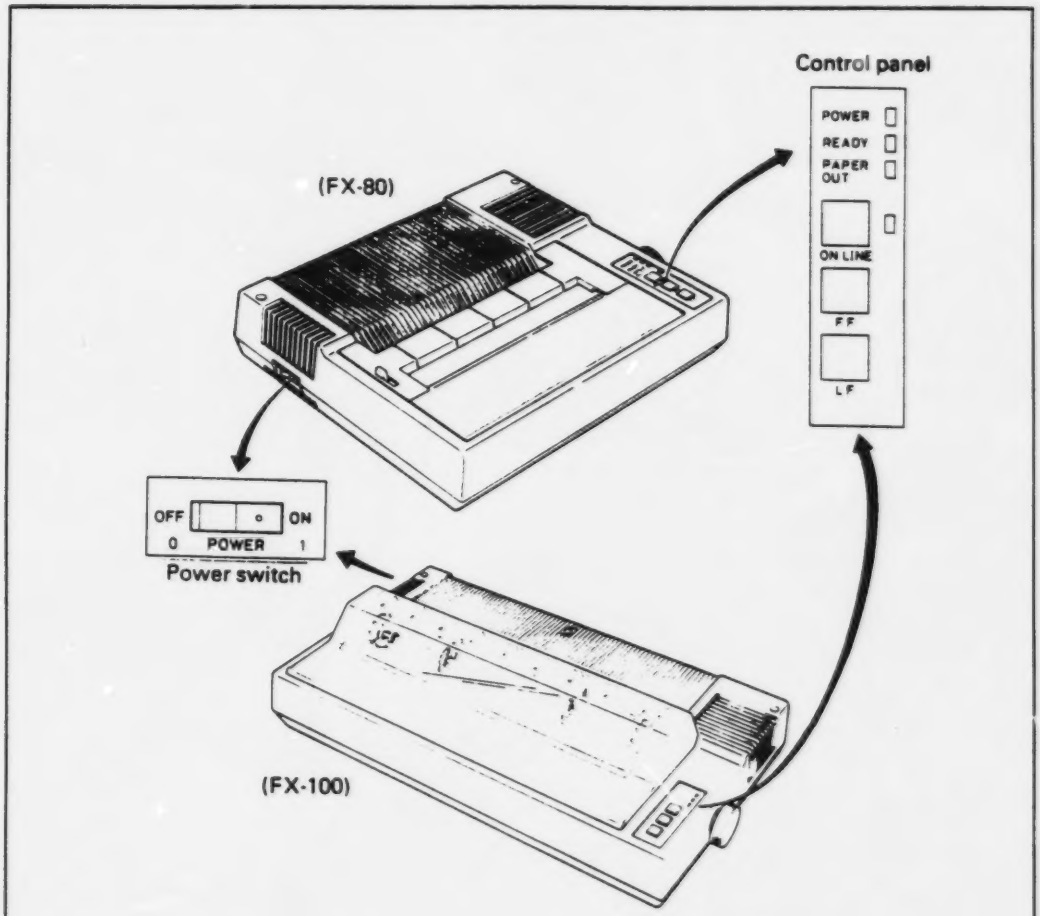

Figure 30. Buttons and Lights on the Printer Control Panel

Printer Control Buttons

1. The **ON LINE** button changes the Online and Offline modes. The printer is in the Online mode when powered on. (ON LINE light is on).

Pressing the **ON LINE** button once places the printer in the Offline mode (ON LINE light is off). Pressing the button once agin places the printer back in the Online mode.

2. The **FORM FEED** (FF) button is pressed to advance the paper to the top of the next page (or form). The printer must be in the Offline mode before the **FF** button will work.

3. The **LINE FEED** (LF) button is pressed to advance the forms to the next line on the page. When the **LINE FEED** button is held down, the paper will continue feeding until the button is released. The printer must be in the Offline mode before the **LF** button will work.

Printer Lights

1. The **POWER** light is on when the printer power is on.

2. The **READY** light is on when the printer is ready to receive information for printing. This light will turn on and off as the printer receives information from the computer.

3. The **PAPER OUT** light is on when the printer is out of paper or near the end. A beeping sound will also be heard from the printer.

4. The **ON LINE** light is on when the printer is prepared to receive information.

Setting the Top of Page

1. Set the printer Power switch to OFF.

2. Raise the printer cover.

3. Using the roller knob, position the paper.

4. Set the printer Power switch to ON.

5. Lower the printer access cover.

6. To change the Top of Page Setting, repeat the previous five steps.

NOTE: The position of the forms, when the printer is powered on, determines where the forms will feed to when the Form Feed command is issued from a program. Pressing the Form Feed button, when the printer is Offline, will also feed the forms to the next Top of Page.

Forms Insertion

The FX-100 is provided with a tractor unit to feed the paper. To load the pin-feed paper, observe the following procedure:

1. Raise the printer cover.

2. Widen the feeding pins to maximum position and open the paper folding covers. The DATASET program requires wide paper. Normal letter size paper is sufficient for the Analyzer program.

3. Pull the scale toward the front of the printer to detach it from the platen.

4. Unlock the release lever.

5. Set the paper guide roller at the center of the sprocket shaft. This contributes to smooth paper feeding.

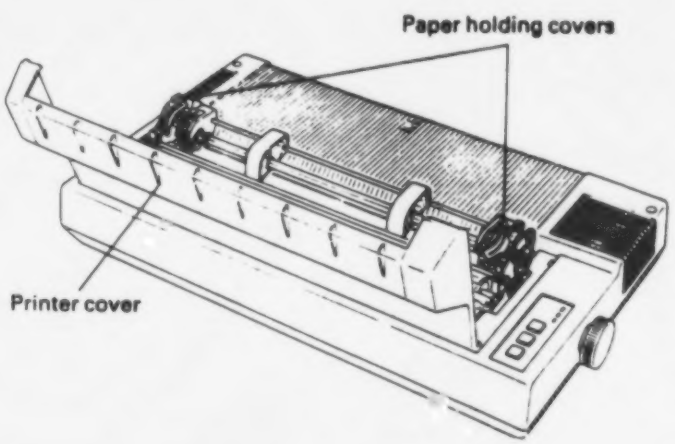

Figure 31. Raising the Printer Cover

6. Insert the pin-feed paper folded in half as shown in Figure 32 on page 36. This way it can be inserted more smoothly.

7. Lock the release lever and advance the paper while turning the manual paper feed knob clockwise. Then unlock the release lever.

8. Engage the paper feed holes of the paper on the feeding pins, push the scale back into position, and adjust the tension of the paper. Then push the paper holding covers back into place.

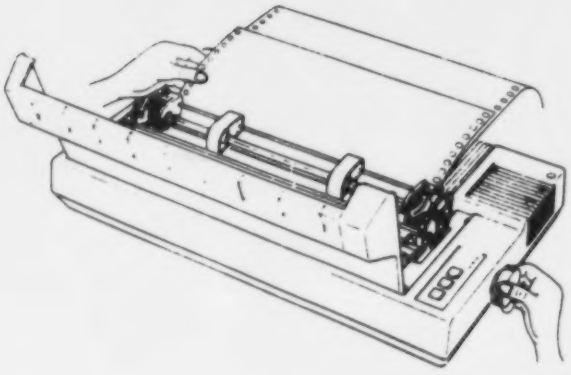

Figure 32. Inserting Pin-feed Paper

9. Set the separator and printer cover on the printer.

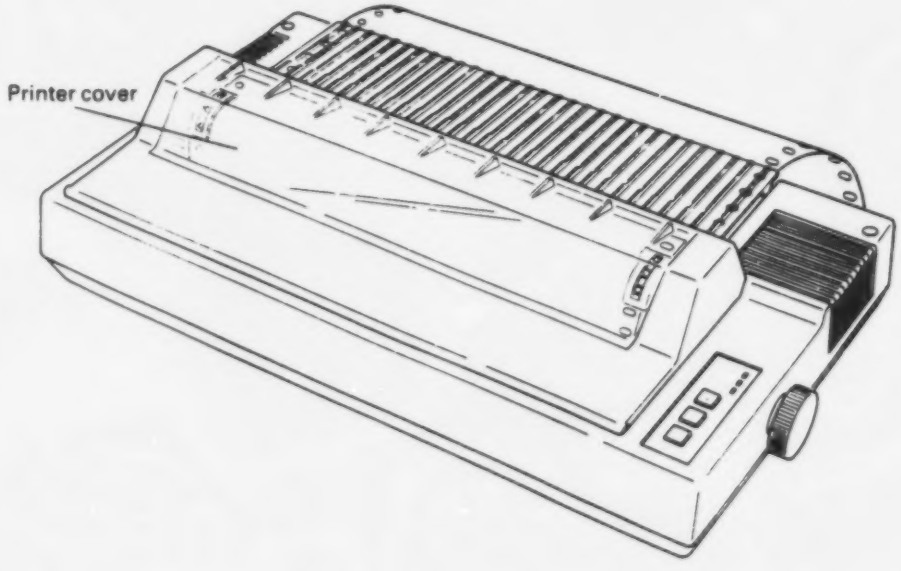

Figure 33. Setting the Printer Cover

APPENDIX B

DATA SET REPORT

DATA SET REPORT
08 MAR 1987 — 19:48 h

CROPPING STRATEGY	SOIL ZONE	LAND PROD.	YIELD RANGE (Bu / Acre)	NITROGEN ($/Crop Acre)	PHOSPHORUS ($/Crop Acre)	CHEMICAL ($/Crop Acre)	FUEL ($/Cult Acre)	INSURANCE ($/Cult Acre)	REPAIRS ($/Cult Acre)	RM TAXES ($/Cult Acre)	POWER ($/Cult Acre)	CUSTOM ($/Cult Acre)	OTHER ($/Cult Acre)	N-LOSS ($/Fallow Acre)
Low input	Bl	Light	28 - 46	0.00	5.00	6.00	9.00	4.00	8.00	2.00	1.50	1.50	12.00	20.00
Low input	Bl	Medium	32 - 48	0.00	6.00	6.00	10.00	4.50	9.00	4.00	1.50	2.00	12.00	22.00
Low input	Bl	Heavy	35 - 51	0.00	7.00	6.00	11.00	5.00	10.00	6.00	1.50	2.50	12.00	24.00
Low input	DB	Light	20 - 42	0.00	4.00	5.00	8.00	3.50	7.00	2.00	1.00	1.00	11.00	17.00
Low input	DB	Medium	26 - 44	0.00	5.00	5.00	9.00	4.00	8.00	4.00	1.00	1.50	11.00	19.00
Low input	DB	Heavy	30 - 48	0.00	6.00	5.00	10.00	4.50	9.00	6.00	1.00	2.00	11.00	21.00
Low input	Br	Light	11 - 39	0.00	3.00	4.00	7.00	3.00	6.00	2.00	0.50	0.50	10.00	14.00
Low input	Br	Medium	18 - 42	0.00	4.00	4.00	8.00	3.50	7.00	4.00	0.50	1.00	10.00	16.00
Low input	Br	Heavy	24 - 44	0.00	5.00	4.00	9.00	4.00	8.00	6.00	0.50	1.50	10.00	18.00
Soil saver	Bl	Light	16 - 42	16.00	6.00	14.00	9.00	5.00	9.00	2.00	2.00	2.00	12.00	0.00
Soil saver	Bl	Medium	20 - 44	18.00	7.00	14.00	10.00	5.50	10.00	4.00	2.00	2.50	12.00	0.00
Soil saver	Bl	Heavy	22 - 50	20.00	8.00	14.00	11.00	6.00	11.00	6.00	2.00	3.00	12.00	0.00
Soil saver	DB	Light	6 - 38	12.00	5.00	12.00	8.00	4.50	8.00	2.00	1.50	1.50	10.00	0.00
Soil saver	DB	Medium	10 - 42	14.00	6.00	12.00	9.00	5.00	9.00	4.00	1.50	2.00	10.00	0.00
Soil saver	DB	Heavy	14 - 46	17.00	7.00	12.00	10.00	5.50	10.00	6.00	1.50	2.50	10.00	0.00
Soil saver	Br	Light	2 - 32	10.00	5.00	11.00	7.00	4.00	7.00	2.00	1.00	1.00	8.00	0.00
Soil saver	Br	Medium	5 - 37	12.00	6.00	11.00	8.00	4.50	8.00	4.00	1.00	1.50	8.00	0.00
Soil saver	Br	Heavy	8 - 40	13.00	7.00	11.00	9.00	5.00	9.00	6.00	1.00	2.00	8.00	0.00

FARM-WEST MANAGEMENT LTD.

APPENDIX C

- Country Guide Article
- Soils and Crops Workshop Paper

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Stubble cropping: Will it pay in 1986?

In the dark brown soil zone, stubble-crop decisions are especially "iffy" this spring. One analysis indicates that with $3.20 wheat, half fallow/half crop looks better than one-third fallow/two-thirds crop. The reverse applies if you want to be optimistic, and assume $4.20 wheat

by BRYAN LYSTER

IS IT WORTH seeding more stubble crop this spring? As the news on grain prices gets worse, that question is on many farmers' minds.

Of course, in the really dry parts of the brown soil zone, the merit of extra stubble crop is not exactly a burning issue. After last year's drought, and with soil moisture reserves very low, farmers have little choice but to stick with half fallow/half crop.

The decision is equally uncomplicated in the wetter parts of the black soil zone. Where rainfall is traditionally high and soil moisture reserves already excellent, stubble cropping probably still makes sense.

In much of the prairies, however, the choice is not so clear-cut. That's especially true in the dark brown soil zone. Soil moisture reserves in some (but not all) parts of that soil zone may be quite good. On the other hand, stubble yields last year were often disappointing. And as grain prices head further into the basement, putting a pile of cash inputs into a more risky stubble crop may not be such a good idea.

The question of extra stubble crop this year in the dark brown (and perhaps even some parts of the thin black) soils is one for which there are no easy answers. Many variables have to be considered. How much will the stubble and summerfallow crops yield? What will those crops be worth? What is the debt level on the farm? What is the total farm acreage?

One analysis by a group of farm management consultants in Saskatoon does shed some light on this difficult question. The analysis, conducted by FarmWest Management Ltd., was done with a cash flow analyzer computer program initially developed by FarmWest as part of an energy conservation project funded by both the federal and Saskatchewan governments.

The purpose of the program is to calculate energy costs and examine cash flow implications of moving from traditional half-and-half rotations to "conservation" or continuous crop rotations. The program is now being refined under another federally funded farm energy project called Ener-Demo. At this point, it is not available commercially.

The program enables a farmer to calculate overall returns from different rotations. He can use actual operating costs for items like fertilizer, chemical, repairs, fuel, and property taxes; and his own numbers for annual loan payments and family living costs. The farmer tells the program what yield and crop price he expects. Then this information is used to produce a cash flow statement for the farm.

FarmWest consultants looked at the stubble-crop question in the dark brown soil zone by trying out several price and quota combinations on a hypothetical 1,500-acre farm. Wheat yields were assumed to be very good at 35 bushels per acre on fallow and 26 bushels on stubble.

This is a high input farm, where fertilizer costs are $20 per acre for stubble land and $14 for fallow land. Average herbicide costs are assumed to be $9 per acre on stubble and $6 per acre on fallow.

Two rotations — one-third fallow/two-thirds crop and half fallow/half crop — were examined. Two wheat prices were used. In the downside projection, a price of $3.20 a bushel was assumed, and in the so-called upside projection, the consultants went with $4.20 wheat.

Both price scenarios were hooked into 2 different quota assumptions. In the first case, a 10-bushel wheat quota was assumed, and in the other, a 30-bushel (virtually open) quota was used. When tight quotas prevented the hypothetical farmer from selling all his wheat to the Canadian Wheat Board, it was assumed he sold it at a 15% discount on the local feed market. For example, with a $3.20 quota price, the farmer facing a 10-bushel quota sells the remainder of his crop for $2.72 per bushel.

Projections were done with the farmer growing only one crop — hard red spring wheat. In the half-and-half rotation, he grew 750 acres of wheat and fallowed 750 acres. In the other rotation, he grew 1,000 acres of wheat and fallowed 500 acres.

Results from all of this are summarized in the graph, shown at the bottom of page 30-B.

The main conclusion? The lower the wheat price goes, the worse stubble cropping looks on this farm.

With $4.20 wheat and 35- and 26-bushel-per-acre yields on fallow and stubble, respectively, the farm does better on one-third/two-thirds than on the half-and-half rotation.

With $3.20 wheat, the reverse applies. The farm loses money under both rotations, but losses are lower with the half-and-half program.

The FarmWest consultants caution that these cash flow conclusions do not necessarily apply to your particular farm. Each case is different. Variations in total acreage, expected stubble yield, size of loan payments, and so on can change the cash flow conclusions. But the case-study farm is typical of many farms on the better soils in the dark brown soil zone.

So the situation is painfully clear. With $3.20 wheat, half-and-half looks better; and losses are lower. And with $4.20 wheat, one-third/two-thirds looks better; it produces a bigger surplus.

Those conclusions apply, regardless of whether the Wheat Board quota is 10 bushels or 30 bushels. With $3.20 wheat and a 10-bushel quota, farm cash flow is −$16,710 on the half-and-half scheme, and −$18,920 on the one-third/two-thirds scheme. With $3.20 wheat and a 30-bushel quota, the loss drops to −$11,850 for half-and-half, and −$12,200 for one-third/two-thirds. Either way, the half-and-half program losses are lower; it also involves less risk. Cash outlays are lower and yields more predictable.

On the so-called upside price section of the graph, the conclusions change. The more extended rotation looks best. At $4.20 wheat and a 10-bushel quota, the one-third/two-thirds rotation produces a +$7,980 cash flow, while half-and-half produces +$6,896. And with the $4.20 price and a 30-bushel quota, the one-third/two-thirds program shows +$16,800, while half-and-half yields +$13,275.

The graph simply shows the cash flow position of the farm under each of the rotation/price/quota combinations tested. Green lines represent cash flow position with the one-third/two-thirds rotation; blue lines represent cash flow with the half-and-half crop rotation. The higher the line on the graph, the better the cash flow position.

If the cash flow points are above the "0" line, the farm is producing enough money to cover operating costs and debt payments. When cash flow points are below the "0" line, the farm isn't even covering operating costs and debt payments. At −$18,920, for example, the farm is $18,920 short of covering operating costs and loan payments.

It's important to note that points above the "0" line don't necessarily mean the farm is operating in a profit position. FarmWest consultants did not charge any family living costs against this test farm. Hence, all living expenses have to come from any surplus above that "0" line and/or other sources, such as off-farm income. Even with $4.20 prices, then, the farm is not really showing a profit. Under the best scenario ($4.20 prices, 30-bushel quota, and one-third/two thirds rotation), the farm produces enough to cover all operating and debt payment costs and provides only $16,800 for family living.

A surplus over that "0" line also represents money available for machinery replacement, income tax, and investments. Obviously, then, none of the price/quota combinations in this example produce any residual for machinery replacement or other "extras," like RRSP investments. At best, the farmer can cover all operating and debt service costs and have $16,800 to put bread on the table. And at worst (with $3.20 wheat), he can't even cover operating costs and loan payments, much less family living or machinery replacement costs.

In the example, it's assumed the farmer has annual loan payments of $21,000 — relatively modest for a farm this size. He would have 75% to 80% equity in his business. The family probably needs about the same amount ($21,000) for annual living

expenses. That's assuming $1,500 per month for basic living costs plus another $3,000 per year for non-farm payments, such as loan payments on a house or car, or post-secondary education for the kids.

In this case, then, one could easily make farm loan payments and family living costs interchangeable. The graph has been set up so that the farm falls on the "0" or breakeven line if it covers operating and loan payment costs. Any surplus above that break-even line is therefore available for family living costs. Conversely, it could be said that at the breakeven line, the farm has covered farm operating and family living (instead of loan payment) costs. Viewed that way, any residual above the "0" line becomes money available for farm loan payments.

In practice, this may be a more realistic approach on many farms. Family living costs have to be covered first; then surplus funds can be put toward loan payments. Looking at the graph that way, the downside price section shows a case where the farmer can't cover operating and family living costs. The family will have to use savings, do off-farm work, sell some assets, or arrange financing to cover the shortfall on farm operating and family living costs. Even then, the farm still won't be able to make any regular loan payments.

On the upside price section of the graph, the farmer can cover operating and family living costs, and still have some surplus left for loan payments. But even in the best case — $4.20 wheat, high quota, and extra stubble crop — the surplus doesn't quite cover assumed loan payments of $21,000.

Regardless of whether the break-even line is defined as covering operating costs plus debt payments, or operating costs plus family living costs, the outcome is the same. With very poor prices, the farm loses less on the half-and-half rotation. But with better prices, the one-third/two-thirds rotation produces a bigger surplus.

Why this change in ranking for the 2 different rotations? FarmWest consultants say it all hinges around production costs and selling prices. "On this 1,500-acre farm with assumed yields of 35 bushels per acre on fallow and 26 bushels on stubble, total production costs amount to roughly $3.60 per bushel for both rotations," says Bob Bens, a FarmWest director. "But operating costs (that is, all costs except loan payments, family living, and machinery replacement) are higher on the stubble-crop system." This difference in operating costs makes the stubble-crop system look worse when prices drop.

On the downside section of the graph, in-quota wheat produced at a total cost of $3.60 per bushel is sold at $3.20. The farmer therefore loses on each bushel produced. But he loses more on the stubble-crop system because he's producing extra volume for sale at a price that doesn't even cover operating costs of $2.90 per bushel (remember, under tight quotas, he's forced to sell part of his crop at $2.72 into the feed market). The more he grows the more he loses.

The extra volume works for the farmer, however, when selling prices are high. On the upside (or $4.20) part of the graph, the price is well above both operating and total production costs. In this situation, he gains by going for extra volume with stubble crop.

Expanding the theory

In some cases, extra volume can work, even if total production costs exceed selling price. With higher stubble yields in the black soil zone, for example, operating costs per bushel are more likely to pencil out to a figure below the market price. And when price exceeds operating costs (but not necessarily total costs), going for extra volume generally makes sense.

Suppose a farmer in the black soil zone has high enough stubble-crop yields that his total production cost is $3.30 per bushel and his operating cost $2.60 per bushel. On the $3.20 wheat market, he'll obviously lose money. But since his operating costs to grow the extra stubble crop are less than the selling price ($2.72), he can reduce his losses by going for extra volume.

A second analysis conducted at FarmWest confirms that theory. In this case, the consultants assumed a 1,500-acre farm in the black soil zone produced 40-bushel fallow crops and 34-bushel stubble crops of wheat. They used the same $3.20 and $4.20 prices and produced cash flow projections for that farm. In both cases, the higher volume one-third fallow/two-thirds crop program was better than a half-and-half scheme.

At $3.20, both rotations lost money, but the extended rotation lost less. At $4.20, both rotations produced a cash surplus, but the extended rotation produced a bigger surplus.

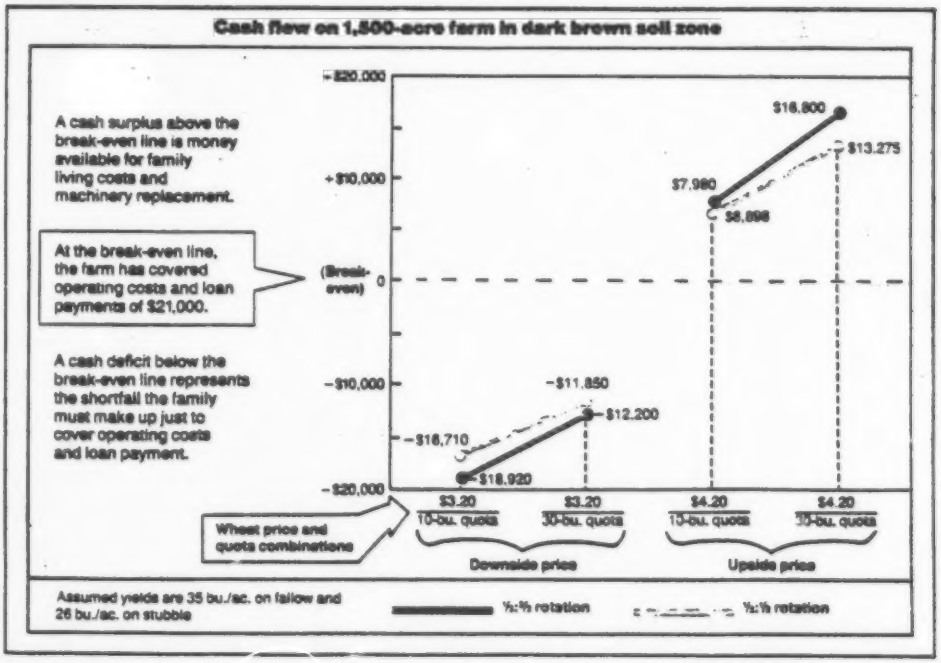
All the above projections assume the farm grows only one crop — hard red spring wheat. On some farms, substitution of different crops, such as flax, lentils, or mustard, might change the cash flow results with the half-and-half and stubble-crop rotations.

Overall, however, there's little chance alternative crops can replace much wheat acreage. Interest in special crops is booming. By late February, contracting companies had already stopped offering production contracts for some crops. Mustard contracts, for example, had been cut off by some firms.

Other firms were warning against growing crops, like canaryseed, without a production contract. These companies anticipate increased canaryseed acreage this year. And with decent yields, growers with non-contract production might have trouble finding markets next fall.

On balance, then, alternative crops may change the economics on some farms. But overall, in the dark brown soil zone, the stubble-crop outlook will continue to hinge around the wheat market. And given current prospects, 1986 looks like a year to reduce risks and cut losses. If growers realize something close to the graph's downside price, a half-and-half rotation in the dark brown soils may be the best way to go.

Cash flow on 1,500-acre farm in dark brown soil zone


+$20,000
+$10,000
(Break-even) 0
-$10,000
-$20,000
A cash surplus above the break-even line is money available for family living costs and machinery replacement.
At the break-even line, the farm has covered operating costs and loan payments of $21,000.
A cash deficit below the break-even line represents the shortfall the family must make up just to cover operating costs and loan payment.
$16,800
$13,275
$7,980
$8,898
-$11,850
-$12,200
-$16,710
-$18,920
$3.20 10-bu. quota
$3.20 30-bu. quota
$4.20 10-bu. quota
$4.20 30-bu. quota
Wheat price and quota combinations
Downside price
Upside price
Assumed yields are 35 bu./ac. on fallow and 26 bu./ac. on stubble
½:⅓ rotation
½:⅓ rotation

BUSINESS ANALYSIS OF CROPPING SYSTEMS

Robert J. Bens
Consultant, ENERDEMO Program
Saskatchewan Research Council

March, 1987

BUSINESS ANALYSIS OF CROPPING SYSTEMS

Robert J. Bens*
Consultant, ENERDEMO Program
Saskatchewan Research Council

1.0 Introduction

The work for this paper was carried out as part of the ENERDEMO project, which is funded by Energy, Mines and Resources Canada in conjunction with Saskatchewan Agriculture. This is a farm program which is studying energy use and conservation on more than 50 prairie farms. A research team from the Saskatchewan Research Council (SRC) in heading up the project with input from several independent consultants.

An input/output analyzer program was used to generate benchmark target scenarios for three soil zones. Sample output is provided in Appendix A. Details concerning the design and operation of the program may be obtained from the SRC ENERDEMO Program or from Farmwest Management Ltd.

Traditional low input cropping systems tend to be "soil users" but the newer high production high input cropping systems tend to be "soil savers" over the long term. This paper is focused on some of the relevant cost/yield relationships which have been demonstrated in recent years using these two very different approaches to cropping configurations.

---

* The author is a Director of Farmwest Management Ltd., an Agrologist Consulting Firm in Saskatoon.

2.0 Low Input vs. Soil Saver Cropping Systems

The farm business analysis done by Farmwest under the F.E.M.P. and ENERDEMO programs has been focused on the cost/yield (input/output) relationships for cropping systems which have an impact on long term soil productivity.

At one end of the continuum are extensive rotations with high tillage, up to 1/2 summerfallow and a minimum of fertilzer. These systems can be loosely described as Low Input Soil User Systems.

At the other end are intensive systems which minimize tillage and summerfallow, and which call for high fertilizer inputs. For this paper, these are referred to as High Input Soil Saver Systems.

2.1 Yield

Benchmark cost/yield relationships have been developed for spring wheat in 3 soil zones. The yield targets have been demonstrated as achievable by research and some successful farmers.

Research has demonstrated that conservation cropping systems can achieve 60-70 kg/hec/cm (or about 2.5 bu/acre/inch) of water used.

The water efficiency assumptions on which the targets in Table 1 are based can be summarized as follows:

	Continuous Crop Yields bu/ac	Water Used cm/year
Black	32	30
D. Brown	26	26
Brown	21	22

Table 1. Benchmark Wheat Yields

	Low Input bu/ac	Soil Saver bu/ac	Soil Saver % of low input
Black	40	32	80%
D. Brown	35	26	74%
Brown	30	21	70%

2.2 Cost/Yield Relationships

2.2.1 High Energy Inputs

The price of major inputs like fertilizers and fuel will continue to be closely linked to trends in energy costs, and these costs are therefore of great interest.

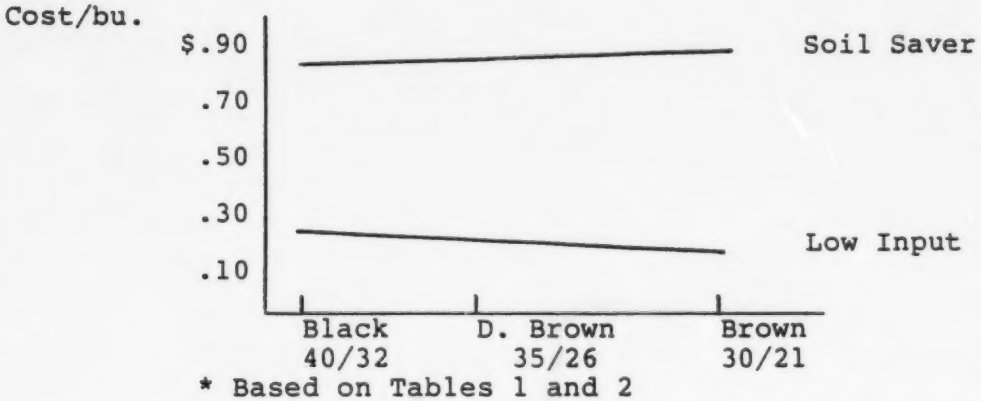
Based on the available data, we can expect fertilizer use to compare as outlined in Table 2 and Figure 1.

Table 2. Fertilizer Used*

	Low Input per acre crop	Soil Saver per acre crop
Black	$7	$24
D. Brown	5	20
Brown	4	18

* Assume $.26/lb. for NO3 and P2O5

Figure 1. Fertilizer Cost/Yield*



* Based on Tables 1 and 2

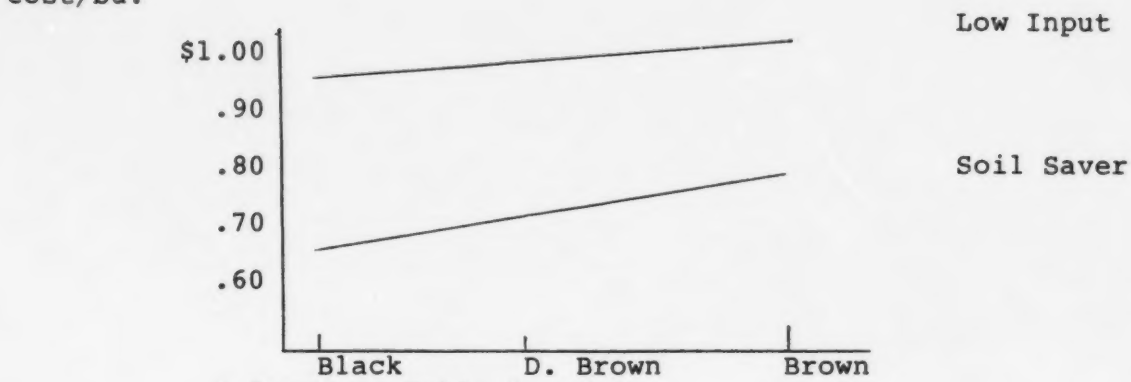
Based on available data, we can expect fuel and repairs to compare as outlined in Table 3 and Figure 2. Fuel use includes grain hauling and about 2/3 of 1/2 ton fuel. See Table 3 and Figure 2.

Table 3. Fuel and Repairs*

	Low Input per acre crop	Soil Saver per acre crop
Black	$38	$20
D. Brown	34	18
Brown	30	16

* Fuel at 55%, repairs 45%

Figure 2. Fuel and Repairs Cost/Yield*



* Based on Table 1 and 3

2.2.2 Other Operating Costs

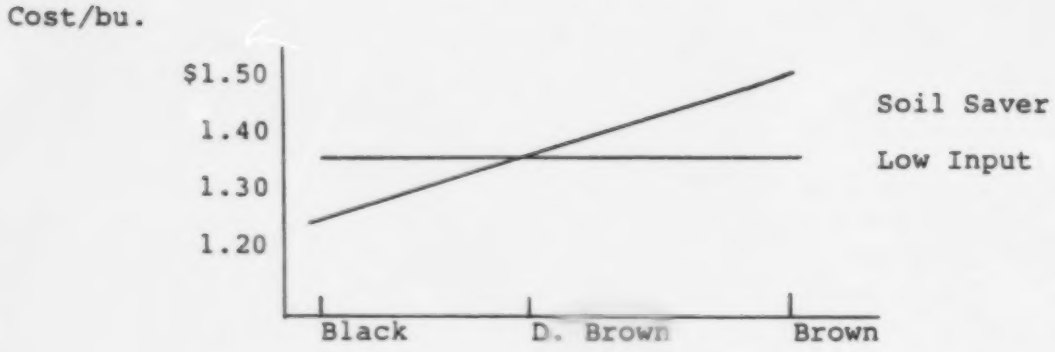
Based on available data, expectations for other operating costs including herbicides, insurance, hired labor, custom work, operating interest etc. are given in Table 4 and Figure 3.

Table 4. Other Operating Costs*

	Low Input per acre crop	Soil Saver per acre crop
Black	$54	$40
D. Brown	47	35
Brown	41	30

* Does not include principal and interest on term debt, depreciation, family living or income tax.

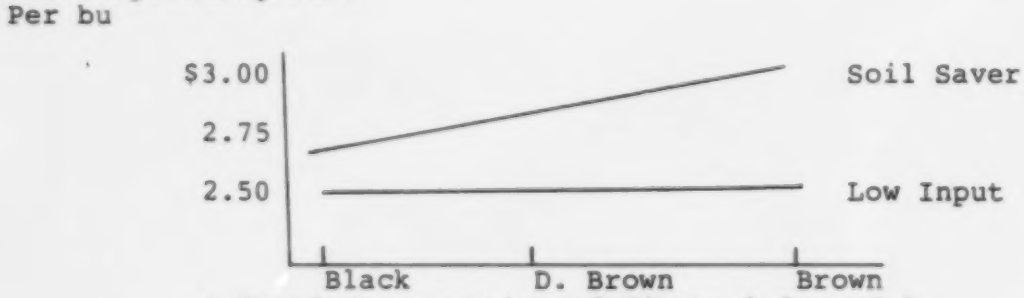
Figure 3. Other Operating Cost/Yield



2.2.3 Total Operating Costs

A summation is given in Figure 4. Note that total operating costs (called variable costs) include the costs that would be avoided if there was no production.

Figure 4. Total Operating Cost/Yield*



* Based on summation of Figure 1,2, and 3.

Reference to Figure 4 shows that based on operating costs "break-even prices" required under the two very different systems is quite similar for the Black Soil Zone. For the Brown

Soil Zone, the "break-even price" is about $.55 per bu. higher for the Soil Saver System.

2.3 Farm Size Implications

Different costs and yields means that farm size requirements will vary by cropping system and by soil zone.

To translate cost/yield data into farm size requirements requires an analysis of total cost, that is, variable cost plus fixed cost.

For a simple analysis assume a fixed cost level of $50,000 as a standard for all farms regardless of location or crop system. See Table 5.

Table 5. Size of Farm Required to Cover Total Cost at $4 wheat*

	Low Input cult. ac	Soil Saver cult. ac
Black	1,640	1,140
D. Brown	1,880	1,620
Brown	2,200	2,500

* Total costs include operating costs as in Figure 4, and fixed cost of $50,000 for each farm to include principal and interest on term loan, municipal tax, family living, income tax and other non business expenses.

In the short term, the decision to maintain a high production cropping system depends on whether or not operating costs are being covered. For the low input systems, this can usually be achieved at somewhere around $2.50/bu. for all soil

zones. For soil saver systems, the requirement is much higher. For each 1,000 cult. acres, the comparisons are given in Table 6.

Table 6. Annual Operating Capital Requirement Per 1000 Cult ac.*

	Low Input $/1000 ac	Soil Saver $/1000 ac
Black	50,000	84,000
D. Brown	43,000	73,000
Brown	37,000	64,000

* Based on 500 ac of summerfallow crop on Low Input System and 1000 acres of stubble crop on a Soil Saver System.

For wheat prices in the range of $2.50 per bu., even the low input system farms cannot get from one year to another without using up savings, defaulting on loans and/or increasing new debt. The problem of "capital rationing" is even more severe for the high input Soil Saver Systems at these low prices. The problem then becomes one of just financing the production.

Although it can be argued (Figure 4) that costs per bushel can be similar for intensive and extensive systems in the Black Soil Zone, the operating capital requirements are still much higher because of all the extra production. Therefore, even in the Black Soil Zone, there will be massive pressures for a move back toward lower input systems with prices in the $2.50/bu. range simply because of the need to use available cash to cover fixed costs.

3.0 MACRO IMPLICATIONS

Price is the ultimate allocator of resources in any market. Prices dictate what technology and what production systems can be used on individual farms.

Low prices will always result in a decrease in supply, although there is a time lag expected in this response.

A problem for grain producers worldwide, is that the government policies and Agronomic research and recommendations of the 1970´s and 1980´s have encouraged high production systems which lock producers into situations where it is more difficult to respond to lower prices by decreasing production. The recovery time for prices is thereby increased because supply is slower to adjust to market requirements. The economic losses suffered by farmers are therefore greater because of the "chronic" nature of oversupply conditions.

So here we have another example of the conflict between micro and macro level results of policies and recommendations aimed either directly or indirectly at increasing production on individual farms.

Once again, Professionals serving Agriculture have proceeded carelessly without considering the price implications associated with policies and recommendations which serve to increase aggregate supplies in the market.

Now, as before, it is individual farm families which have to bear the burden of adjusting to insufficient cash flow. The adjustment required on many farms in Western Canada is to shift back to more traditional low input cropping systems. For farms on Brown and Dark Brown Soils, this can result in lower operating costs per bushel. For farms in the Black Soil Zone, the main advantage to shifting back will be to decrease the need for operating funds to keep the farm alive.

Insofar as energy intensive inputs are concerned, the net effect of these changes will be to decrease the expenditure per bushel and across the grain sector as a whole. Although a trend to low input tillage intensive systems should not be expected to have much effect on the total consumption of fuel at the aggregate level, energy requirements for fertilizer production should be expected to show a dramatic decrease. Conversely "soil mining" will increase to provide the source of Nitrogen for low input crop systems.

APPENDIX A

- Comparative studies for benchmark cost/yield scenarios
- Cash flow summaries
- Analysis of cost per bushel yield
- Comparisons using graphics

Assumptions Used For These Cash Flows

- analysis based on wheat
- three year projections
- 1,800 acres in Brown, 1500 acres in Dark Brown and 1200 acres in Black Soil Zone
- $25,000 family living plus $25,000 debt service (P+I on term debt) for all case farms
- 15 bu. quota and $4/quota price
- full quota results in $3.20 discount price
- all production is sold, no storage
- no price trends used
- "Nitrogen Loss" item included to show N fertilizer cost "escaped" in low input system (estimated for this analysis at $.55 (bu. yield)

NOTE: Details concerning the operation of the Cash Flow Analyzer program are availabe from the Saskatchewan Research Council or Farmwest Management Ltd.

CROPPING STRATEGY CASH FLOW ANALYZER
INPUT DATA
11 MAR 1987 — 17:58 h

CROPPING STRATEGY	(1-Low input 2-Soil saver)	1
LAND PRODUCTIVITY	(1-Light 2-Medium 3-Heavy)	2
R.M. NUMBER		231
NAME	(Last, First)	BROWN SOIL ZONE
CULTIVATED ACRES	(Acres)	1800
QUOTA ACRES	(Acres)	1800
QUOTA	(Bu/Acre)	15.0
QUOTA PRICE	($/Bu)	4.00
CROP INSURANCE THRESHOLD	(Bu/Acre)	0.0
DISCOUNT RATE	(Percent)	80
GRAIN IN STORAGE	(Bushels)	0
CARRY OVER STORAGE LIMIT	(Bushels)	0
LIVING EXPENSE	($/Year)	25000
DEBT SERVICE	($/Year)	25000
INFLATION RATE	(Percent)	+0
GRAIN PRICE TREND	(Percent)	+0
YIELD LAST YEAR	(Bu/Acre)	30
NUMBER OF YEARS IN PROJECTION	(1 to 8)	3
YIELD LOWER LIMIT	(Bu/Acre)	18
YIELD UPPER LIMIT	(Bu/Acre)	42
NITROGEN FERTILIZER	($/Crop Acre)	0.00
PHOSPHORUS FERTILIZER	($/Crop Acre)	4.00
CHEMICALS	($/Crop Acre)	4.00
FUEL	($/Cult Acre)	8.00
INSURANCE	($/Cult Acre)	3.50
REPAIR	($/Cult Acre)	7.00
R.M. TAXES	($/Cult Acre)	4.00
POWER	($/Cult Acre)	0.50
CUSTOM WORK	($/Cult Acre)	1.00
OTHER	($/Cult Acre)	10.00
NITROGEN LOSS	($/Fallow Acre)	16.00
RANDOM NUMBER SEED	(0 to 32767)	1017

YOU HAVE SELECTED:

A traditional low cost cropping system with half crop and half summerfallow

Your farm has 1800 cultivated acres, and
900 acres in crop

Grain Prices $4.00/bu quota price
$3.20/bu discount price
+0% yearly trend

Inflation +0% yearly trend

Yields lower limit 18 bu/ac
upper limit 42 bu/ac

CASH FLOW REPORT
11 MAR 1987 — 17:58 h

NAME: BROWN SOIL ZONE

YEAR	1	2	3	ACCUMULATED	$ PER CROP ACRE	$ PER BUSHEL SOLD	ANNUAL MEAN
PRODUCTION							
Bushels/Acre	24	35	31				30
Bushels	21,600	31,500	27,900	81,000			27,000
REVENUE							
Quota Sales	81,000	108,000	106,200	295,200	109.33	3.84	98,400
Discount Sales	0	10,080	0	10,080	3.73	0.13	3,360
Ins Claims Recd	0	0	0	0	0.00	0.00	0
Total Revenue	81,000	118,080	106,200	305,280	113.07	3.97	101,760
CASH OUTLAY							
Nitrogen Fert	0	0	0	0	0.00	0.00	0
Phosphorus Fert	3,600	3,600	3,600	10,800	4.00	0.14	3,600
Chemicals	3,600	3,600	3,600	10,800	4.00	0.14	3,600
Fuel	13,536	15,120	14,544	43,200	16.00	0.56	14,400
Insurance	6,300	6,300	6,300	18,900	7.00	0.25	6,300
Repairs	11,844	13,230	12,726	37,800	14.00	0.49	12,600
R.M. Taxes	7,200	7,200	7,200	21,600	8.00	0.28	7,200
Power	900	900	900	2,700	1.00	0.04	900
Custom Work	1,800	1,800	1,800	5,400	2.00	0.07	1,800
Other	18,000	18,000	18,000	54,000	20.00	0.70	18,000
Living Expenses	25,000	25,000	25,000	75,000	27.78	0.97	25,000
Debt Service	25,000	25,000	25,000	75,000	27.78	0.97	25,000
Total Cash Outlay	116,780	119,750	118,670	355,200	131.56	4.62	118,400
SURPLUS / DEFICIT	-35,780	-1,670	-12,470	-49,920	-18.49	-0.65	-16,640
Accum Surp / Def	-35,780	-37,450	-49,920				
Nitrogen Loss	14,400	14,400	14,400	43,200	16.00	0.56	14,400
Adjust Surp / Def	-50,180	-16,070	-26,870	-93,120	-34.49	-1.21	-31,040
Grain in Storage	0	0	0				0

YIELD SUMMARY

The average yield is 30 bu/ac. The expected annual deviation is 4 bu/ac.

SURPLUS / DEFICIT AS A FUNCTION OF QUOTA PRICE

Quota price	3.00			-126,240	-46.76	-1.64	-42,080
	4.00			-49,920	-18.49	-0.65	-16,640
	5.00			26,400	9.78	0.34	8,800

SUMMARY OF SELECTED COSTS

Nitrogen Fert	0	0	0	0	0.00	0.00	0
Phosphorus Fert	3,600	3,600	3,600	10,800	4.00	0.14	3,600
Chemicals	3,600	3,600	3,600	10,800	4.00	0.14	3,600
Fuel	13,536	15,120	14,544	43,200	16.00	0.56	14,400
Power	900	900	900	2,700	1.00	0.04	900
Total	21,636	23,220	22,644	67,500	25.00	0.88	22,500

CASH FLOW SUMMARY

You have a deficit of $ -49,920 after 3 years. You need at least this much new debt to continue. If you replace any machinery or equipment, or have to pay any income tax, you will have to borrow money for that too.

CROPPING STRATEGY CASH FLOW ANALYZER
INPUT DATA
11 MAR 1987 — 17:58 h

CROPPING STRATEGY	(1-Low input 2-Soil saver)	2
LAND PRODUCTIVITY	(1-Light 2-Medium 3-Heavy)	2
R.M. NUMBER		231
NAME	(Last, First)	BROWN SOIL ZONE
CULTIVATED ACRES	(Acres)	1800
QUOTA ACRES	(Acres)	2400
QUOTA	(Bu/Acre)	15.0
QUOTA PRICE	($/Bu)	4.00
CROP INSURANCE THRESHOLD	(Bu/Acre)	0.0
DISCOUNT RATE	(Percent)	80
GRAIN IN STORAGE	(Bushels)	0
CARRY OVER STORAGE LIMIT	(Bushels)	0
LIVING EXPENSE	($/Year)	25000
DEBT SERVICE	($/Year)	25000
INFLATION RATE	(Percent)	+0
GRAIN PRICE TREND	(Percent)	+0
YIELD LAST YEAR	(Bu/Acre)	21
NUMBER OF YEARS IN PROJECTION	(1 to 8)	3
YIELD LOWER LIMIT	(Bu/Acre)	5
YIELD UPPER LIMIT	(Bu/Acre)	37
NITROGEN FERTILIZER	($/Crop Acre)	12.00
PHOSPHORUS FERTILIZER	($/Crop Acre)	6.00
CHEMICALS	($/Crop Acre)	11.00
FUEL	($/Cult Acre)	8.00
INSURANCE	($/Cult Acre)	4.50
REPAIR	($/Cult Acre)	6.00
R.M. TAXES	($/Cult Acre)	4.00
POWER	($/Cult Acre)	1.00
CUSTOM WORK	($/Cult Acre)	1.50
OTHER	($/Cult Acre)	8.00
NITROGEN LOSS	($/Fallow Acre)	0.00
RANDOM NUMBER SEED	(0 to 32767)	1017

YOU HAVE SELECTED:

A high input conservation cropping system with all crop and no summerfallow

Your farm has 1800 cultivated acres, and
1800 acres in crop

Grain Prices
$4.00/bu quota price
$3.20/bu discount price
+0% yearly trend

Inflation +0% yearly trend

Yields lower limit 5 bu/ac
upper limit 37 bu/ac

CASH FLOW REPORT
11 MAR 1987 — 17:58 h

NAME: BROWN SOIL ZONE

YEAR	1	2	3	ACCUMULATED	$ PER CROP ACRE	$ PER BUSHEL SOLD	ANNUAL MEAN
PRODUCTION							
Bushels/Acre	13	28	22				21
Bushels	23,400	50,400	39,600	113,400			37,800
REVENUE							
Quota Sales	82,800	144,000	144,000	370,800	68.67	3.52	123,600
Discount Sales	0	37,440	2,880	40,320	7.47	0.38	13,440
Ins Claims Recd	0	0	0	0	0.00	0.00	0
Total Revenue	82,800	181,440	146,880	411,120	76.13	3.90	137,040
CASH OUTLAY							
Nitrogen Fert	21,600	21,600	28,800	72,000	13.33	0.68	24,000
Phosphorus Fert	10,800	10,800	10,800	32,400	6.00	0.31	10,800
Chemicals	19,800	19,800	19,800	59,400	11.00	0.56	19,800
Fuel	12,754	15,840	14,606	43,200	8.00	0.41	14,400
Insurance	8,100	8,100	8,100	24,300	4.50	0.23	8,100
Repairs	12,754	15,840	14,606	43,200	8.00	0.41	14,400
R.M. Taxes	7,200	7,200	7,200	21,600	4.00	0.21	7,200
Power	1,800	1,800	1,800	5,400	1.00	0.05	1,800
Custom Work	2,700	2,700	2,700	8,100	1.50	0.08	2,700
Other	14,400	14,400	14,400	43,200	8.00	0.41	14,400
Living Expenses	25,000	25,000	25,000	75,000	13.89	0.71	25,000
Debt Service	25,000	25,000	25,000	75,000	13.89	0.71	25,000
Total Cash Outlay	161,908	168,080	172,812	502,800	93.11	4.77	167,600
SURPLUS / DEFICIT	-79,108	13,360	-25,932	-91,680	-16.98	-0.87	-30,560
Accum Surp / Def	-79,108	-65,748	-91,680				
Nitrogen Loss	0	0	0	0	0.00	0.00	0
Adjust Surp / Def	-79,108	13,360	-25,932	-91,680	-16.98	-0.87	-30,560
Grain in Storage	0	0	0				0

YIELD SUMMARY

The average yield is 21 bu/ac. The expected annual deviation is 5 bu/ac.

SURPLUS / DEFICIT AS A FUNCTION OF QUOTA PRICE

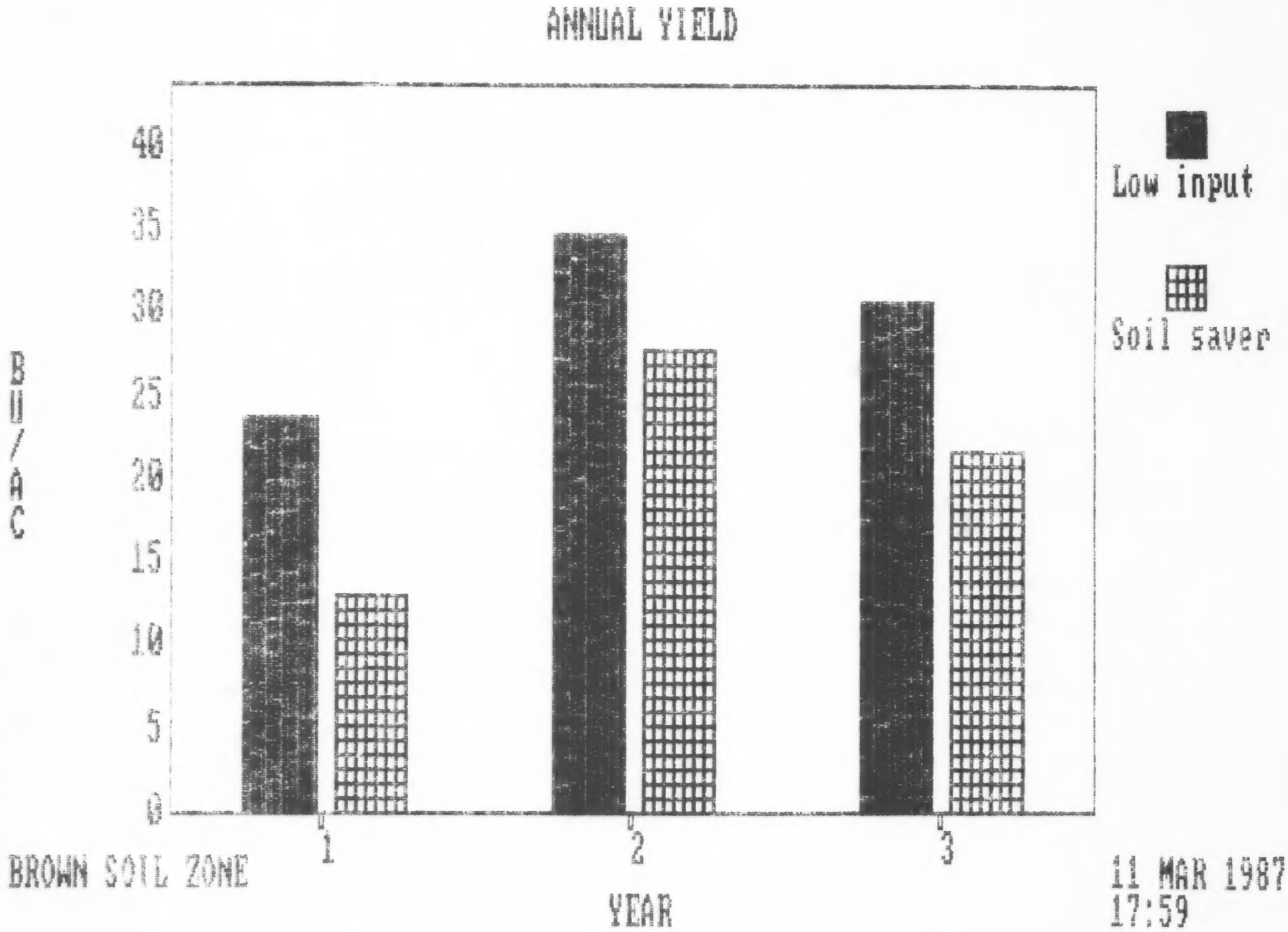
Quota price	3.00			-194,460	-36.01	-1.85	-64,820
	4.00			-91,680	-16.98	-0.87	-30,560
	5.00			11,100	2.06	0.11	3,700

SUMMARY OF SELECTED COSTS

Nitrogen Fert	21,600	21,600	28,800	72,000	13.33	0.68	24,000
Phosphorus Fert	10,800	10,800	10,800	32,400	6.00	0.31	10,800
Chemicals	19,800	19,800	19,800	59,400	11.00	0.56	19,800
Fuel	12,754	15,840	14,606	43,200	8.00	0.41	14,400
Power	1,800	1,800	1,800	5,400	1.00	0.05	1,800
Total	66,754	69,840	75,806	212,400	39.33	2.02	70,800

CASH FLOW SUMMARY

You have a deficit of $ -91,680 after 3 years. You need at least this much new debt to continue. If you replace any machinery or equipment, or have to pay any income tax, you will have to borrow money for that too.


ANNUAL YIELD
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35
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BU/AC
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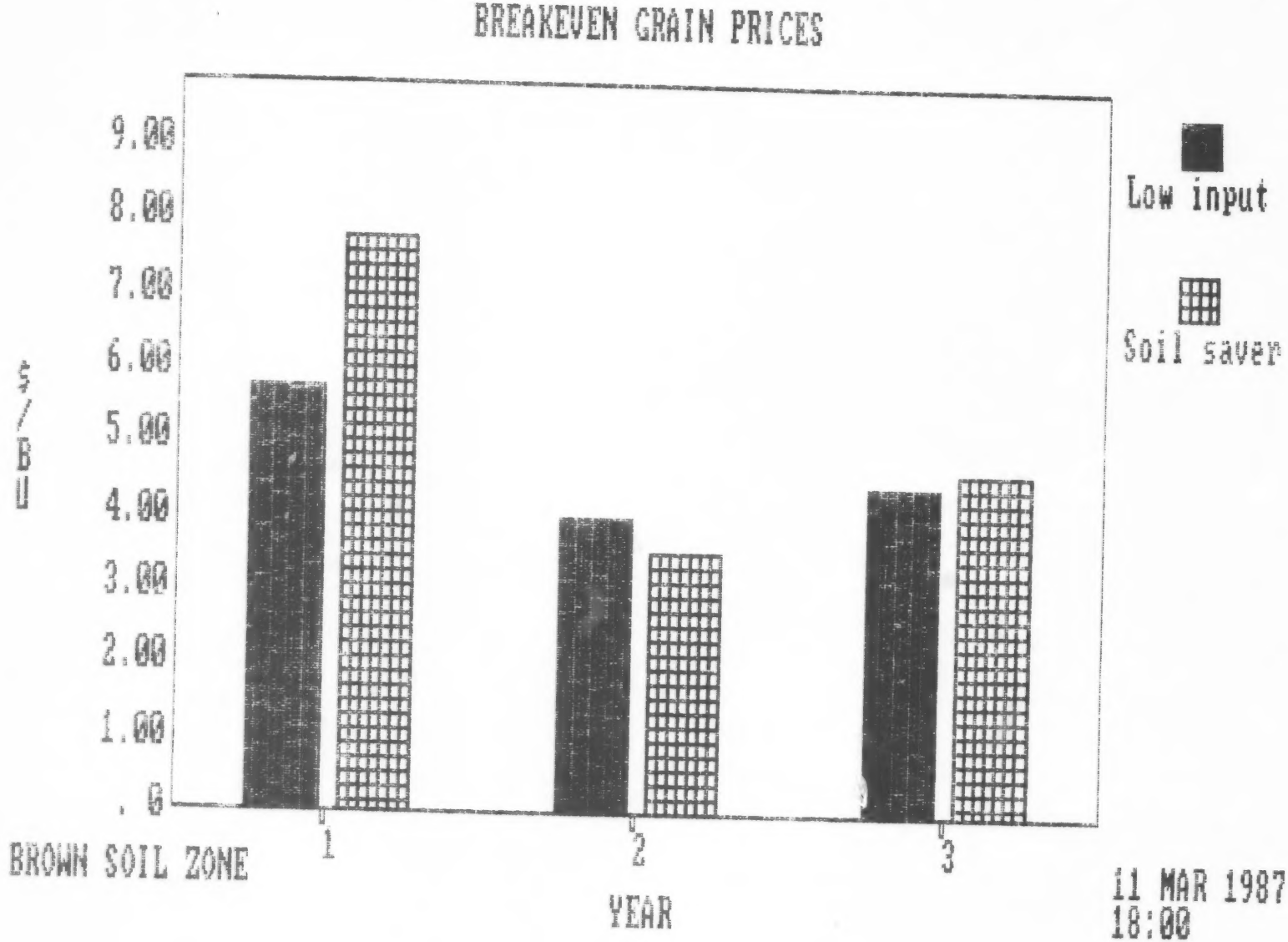
YEAR
Low input
Soil saver
BROWN SOIL ZONE
11 MAR 1987
17:59


BREAKEVEN GRAIN PRICES
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BROWN SOIL ZONE
11 MAR 1987
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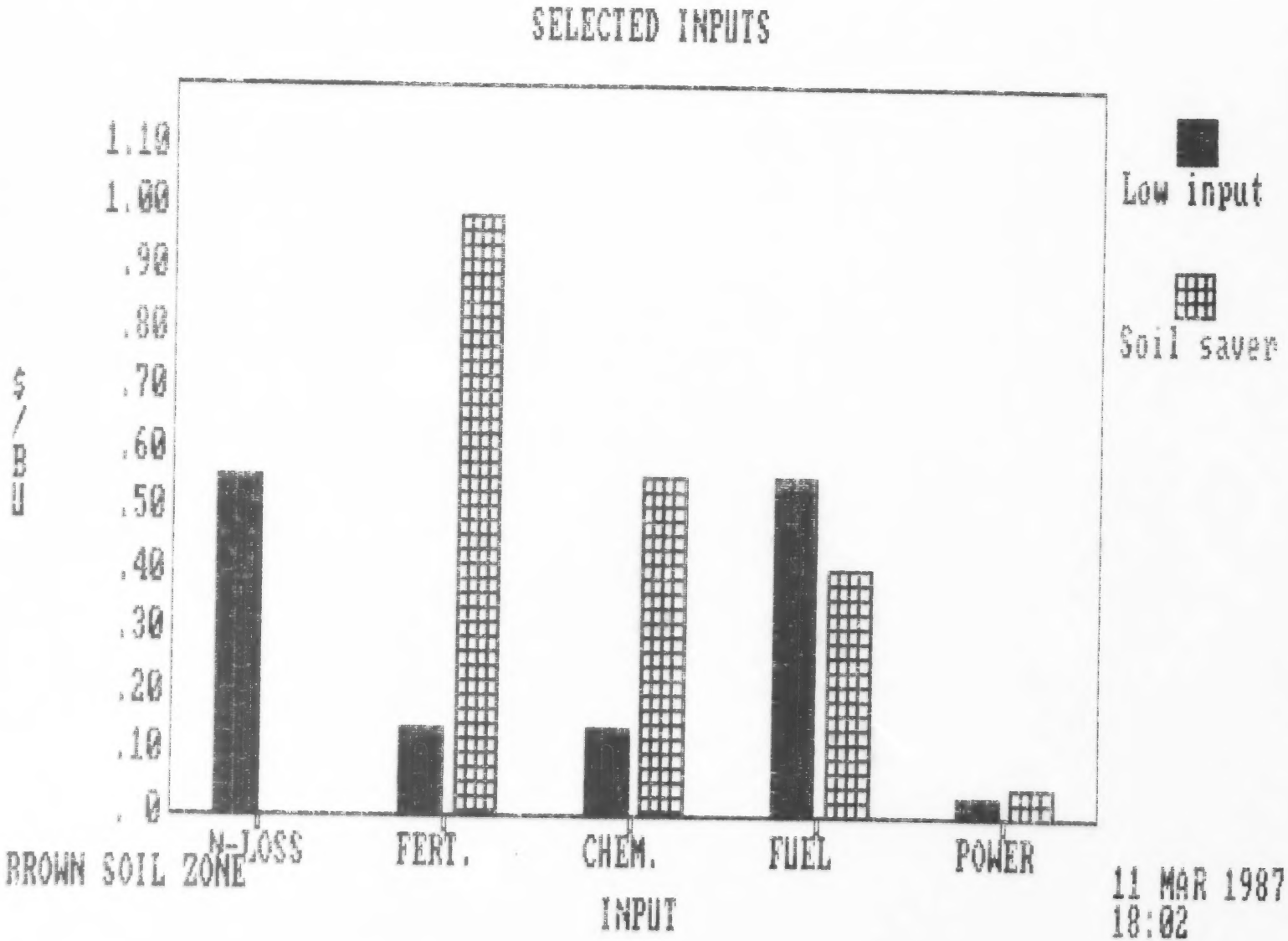
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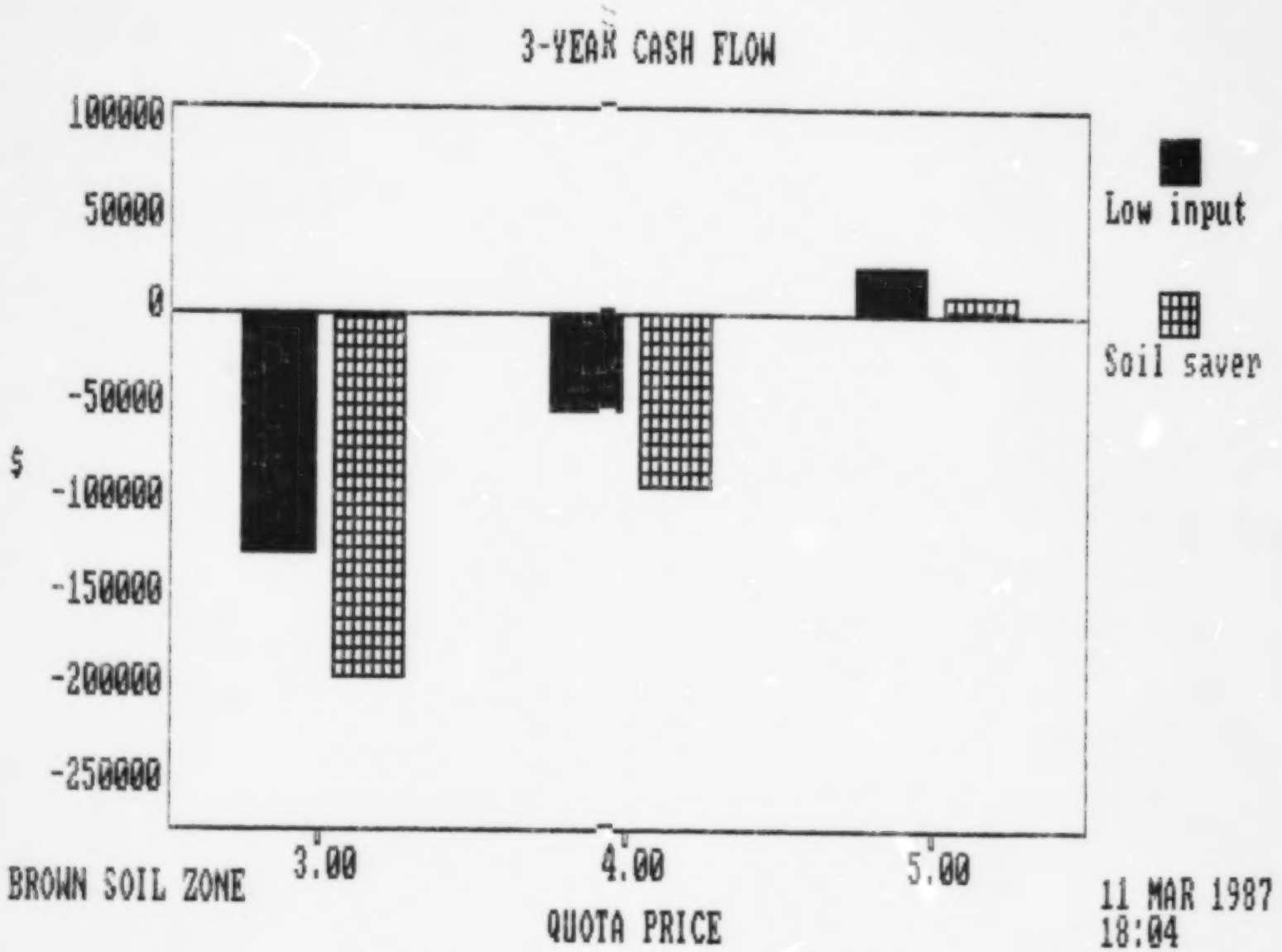
11 MAR 1987
18:02


3-YEAR CASH FLOW
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-100000
-150000
-200000
-250000
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4.00
5.00
QUOTA PRICE
Low input
Soil saver
BROWN SOIL ZONE
11 MAR 1987
18:04

CROPPING STRATEGY CASH FLOW ANALYZER
INPUT DATA
11 MAR 1987 — 18:12 h

CROPPING STRATEGY	(1-Low input 2-Soil saver)	1
LAND PRODUCTIVITY	(1-Light 2-Medium 3-Heavy)	2
R.M. NUMBER		347
NAME	(Last, First)	D BROWN SOIL ZONE
CULTIVATED ACRES	(Acres)	1500
QUOTA ACRES	(Acres)	1500
QUOTA	(Bu/Acre)	15.0
QUOTA PRICE	($/Bu)	4.00
CROP INSURANCE THRESHOLD	(Bu/Acre)	0.0
DISCOUNT RATE	(Percent)	80
GRAIN IN STORAGE	(Bushels)	0
CARRY OVER STORAGE LIMIT	(Bushels)	0
LIVING EXPENSE	($/Year)	25000
DEBT SERVICE	($/Year)	25000
INFLATION RATE	(Percent)	+0
GRAIN PRICE TREND	(Percent)	+0
YIELD LAST YEAR	(Bu/Acre)	35
NUMBER OF YEARS IN PROJECTION	(1 to 8)	3
YIELD LOWER LIMIT	(Bu/Acre)	26
YIELD UPPER LIMIT	(Bu/Acre)	44
NITROGEN FERTILIZER	($/Crop Acre)	0.00
PHOSPHORUS FERTILIZER	($/Crop Acre)	5.00
CHEMICALS	($/Crop Acre)	5.00
FUEL	($/Cult Acre)	9.00
INSURANCE	($/Cult Acre)	4.00
REPAIR	($/Cult Acre)	8.00
R.M. TAXES	($/Cult Acre)	4.00
POWER	($/Cult Acre)	1.00
CUSTOM WORK	($/Cult Acre)	1.50
OTHER	($/Cult Acre)	11.00
NITROGEN LOSS	($/Fallow Acre)	19.00
RANDOM NUMBER SEED	(0 to 32767)	1017

YOU HAVE SELECTED:

A traditional low cost cropping system with half crop and half summerfallow

Your farm has 1500 cultivated acres, and
750 acres in crop

Grain Prices		$4.00/bu	quota price
		$3.20/bu	discount price
		+0%	yearly trend
Inflation		+0%	yearly trend
Yields	lower limit	26	bu/ac
	upper limit	44	bu/ac

CASH FLOW REPORT
11 MAR 1987 — 18:12 h

NAME: D BROWN SOIL ZONE

YEAR	1	2	3	ACCUMULATED	$ PER CROP ACRE	$ PER BUSHEL SOLD	ANNUAL MEAN
PRODUCTION							
Bushels/Acre	30	39	36				35
Bushels	22,500	29,250	27,000	78,750			26,250
REVENUE							
Quota Sales	85,500	90,000	90,000	265,500	118.00	3.52	88,500
Discount Sales	0	18,000	10,800	28,800	12.80	0.38	9,600
Ins Claims Recd	0	0	0	0	0.00	0.00	0
Total Revenue	85,500	108,000	100,800	294,300	130.80	3.90	98,100
CASH OUTLAY							
Nitrogen Fert	0	0	0	0	0.00	0.00	0
Phosphorus Fert	3,750	3,750	3,750	11,250	5.00	0.15	3,750
Chemicals	3,750	3,750	3,750	11,250	5.00	0.15	3,750
Fuel	12,921	13,963	13,616	40,500	18.00	0.54	13,500
Insurance	6,000	6,000	6,000	18,000	8.00	0.24	6,000
Repairs	11,486	12,411	12,103	36,000	16.00	0.48	12,000
R.M. Taxes	6,000	6,000	6,000	18,000	8.00	0.24	6,000
Power	1,500	1,500	1,500	4,500	2.00	0.06	1,500
Custom Work	2,250	2,250	2,250	6,750	3.00	0.09	2,250
Other	16,500	16,500	16,500	49,500	22.00	0.66	16,500
Living Expenses	25,000	25,000	25,000	75,000	33.33	1.00	25,000
Debt Service	25,000	25,000	25,000	75,000	33.33	1.00	25,000
Total Cash Outlay	114,157	116,124	115,469	345,750	153.67	4.59	115,250
SURPLUS / DEFICIT	-28,657	-8,124	-14,669	-51,450	-22.87	-0.68	-17,150
Accum Surp / Def	-28,657	-36,781	-51,450				
Nitrogen Loss	14,250	14,250	14,250	42,750	19.00	0.57	14,250
Adjust Surp / Def	-42,907	-22,374	-28,919	-94,200	-41.87	-1.25	-31,400
Grain in Storage	0	0	0				0

YIELD SUMMARY

The average yield is 35 bu/ac. The expected annual deviation is 3 bu/ac.

SURPLUS / DEFICIT AS A FUNCTION OF QUOTA PRICE

Quota price 3.00			-125,025	-55.57	-1.66	-41,675
4.00			-51,450	-22.87	-0.68	-17,150
5.00			22,125	9.83	0.29	7,375

SUMMARY OF SELECTED COSTS

Nitrogen Fert	0	0	0	0	0.00	0.00	0
Phosphorus Fert	3,750	3,750	3,750	11,250	5.00	0.15	3,750
Chemicals	3,750	3,750	3,750	11,250	5.00	0.15	3,750
Fuel	12,921	13,963	13,616	40,500	18.00	0.54	13,500
Power	1,500	1,500	1,500	4,500	2.00	0.06	1,500
Total	21,921	22,963	22,616	67,500	30.00	0.90	22,500

CASH FLOW SUMMARY

You have a deficit of $ -51,450 after 3 years. You need at least this much new debt to continue. If you replace any machinery or equipment, or have to pay any income tax, you will have to borrow money for that too.

CROPPING STRATEGY CASH FLOW ANALYZER
INPUT DATA
11 MAR 1987 - 18:12 h

CROPPING STRATEGY	(1-Low input 2-Soil saver)	2
LAND PRODUCTIVITY	(1-Light 2-Medium 3-Heavy)	2
R.M. NUMBER		347
NAME	(Last, First)	D BROWN SOIL ZONE
CULTIVATED ACRES	(Acres)	1500
QUOTA ACRES	(Acres)	2000
QUOTA	(Bu/Acre)	15.0
QUOTA PRICE	($/Bu)	4.00
CROP INSURANCE THRESHOLD	(Bu/Acre)	0.0
DISCOUNT RATE	(Percent)	80
GRAIN IN STORAGE	(Bushels)	0
CARRY OVER STORAGE LIMIT	(Bushels)	0
LIVING EXPENSE	($/Year)	25000
DEBT SERVICE	($/Year)	25000
INFLATION RATE	(Percent)	+0
GRAIN PRICE TREND	(Percent)	+0
YIELD LAST YEAR	(Bu/Acre)	26
NUMBER OF YEARS IN PROJECTION	(1 to 8)	3
YIELD LOWER LIMIT	(Bu/Acre)	10
YIELD UPPER LIMIT	(Bu/Acre)	42
NITROGEN FERTILIZER	($/Crop Acre)	14.00
PHOSPHORUS FERTILIZER	($/Crop Acre)	6.00
CHEMICALS	($/Crop Acre)	12.00
FUEL	($/Cult Acre)	7.00
INSURANCE	($/Cult Acre)	5.00
REPAIR	($/Cult Acre)	9.00
R.M. TAXES	($/Cult Acre)	4.00
POWER	($/Cult Acre)	1.50
CUSTOM WORK	($/Cult Acre)	2.00
OTHER	($/Cult Acre)	10.00
NITROGEN LOSS	($/Fallow Acre)	0.00
RANDOM NUMBER SEED	(0 to 32767)	1017

YOU HAVE SELECTED:

A high input conservation cropping system with all crop and no summerfallow

Your farm has 1500 cultivated acres, and
1500 acres in crop

Grain Prices
$4.00/bu quota price
$3.20/bu discount price
+0% yearly trend

Inflation +0% yearly trend

Yields lower limit 10 bu/ac
upper limit 42 bu/ac

CASH FLOW REPORT
11 MAR 1987 — 18:12 h

NAME: D BROWN SOIL ZONE

YEAR	1	2	3	ACCUMULATED	$ PER CROP ACRE	$ PER BUSHEL SOLD	ANNUAL MEAN
PRODUCTION							
Bushels/Acre	18	33	27				26
Bushels	27,000	49,500	40,500	117,000			39,000
REVENUE							
Quota Sales	99,000	120,000	120,000	339,000	75.33	3.07	113,000
Discount Sales	0	55,200	26,400	81,600	18.13	0.74	27,200
Ins Claims Recd	0	0	0	0	0.00	0.00	0
Total Revenue	99,000	175,200	146,400	420,600	93.47	3.81	140,200
CASH OUTLAY							
Nitrogen Fert	21,000	21,000	26,654	68,654	15.26	0.62	22,885
Phosphorus Fert	9,000	9,000	9,000	27,000	6.00	0.24	9,000
Chemicals	18,000	18,000	18,000	54,000	12.00	0.49	18,000
Fuel	12,254	14,590	13,656	40,500	9.00	0.37	13,500
Insurance	7,500	7,500	7,500	22,500	5.00	0.20	7,500
Repairs	12,254	14,590	13,656	40,500	9.00	0.37	13,500
R.M. Taxes	6,000	6,000	6,000	18,000	4.00	0.16	6,000
Power	2,250	2,250	2,250	6,750	1.50	0.06	2,250
Custom Work	3,000	3,000	3,000	9,000	2.00	0.08	3,000
Other	15,000	15,000	15,000	45,000	10.00	0.41	15,000
Living Expenses	25,000	25,000	25,000	75,000	16.67	0.68	25,000
Debt Service	25,000	25,000	25,000	75,000	16.67	0.68	25,000
Total Cash Outlay	156,258	160,930	164,716	481,904	107.09	4.37	160,635
SURPLUS / DEFICIT	-57,258	14,270	-18,316	-61,304	-13.62	-0.56	-20,435
Accum Surp / Def	-57,258	-42,988	-61,304				
Nitrogen Loss	0	0	0	0	0.00	0.00	0
Adjust Surp / Def	-57,258	14,270	-18,316	-61,304	-13.62	-0.56	-20,435
Grain in Storage	0	0	0				0

YIELD SUMMARY

The average yield is 26 bu/ac. The expected annual deviation is 5 bu/ac.

SURPLUS / DEFICIT AS A FUNCTION OF QUOTA PRICE

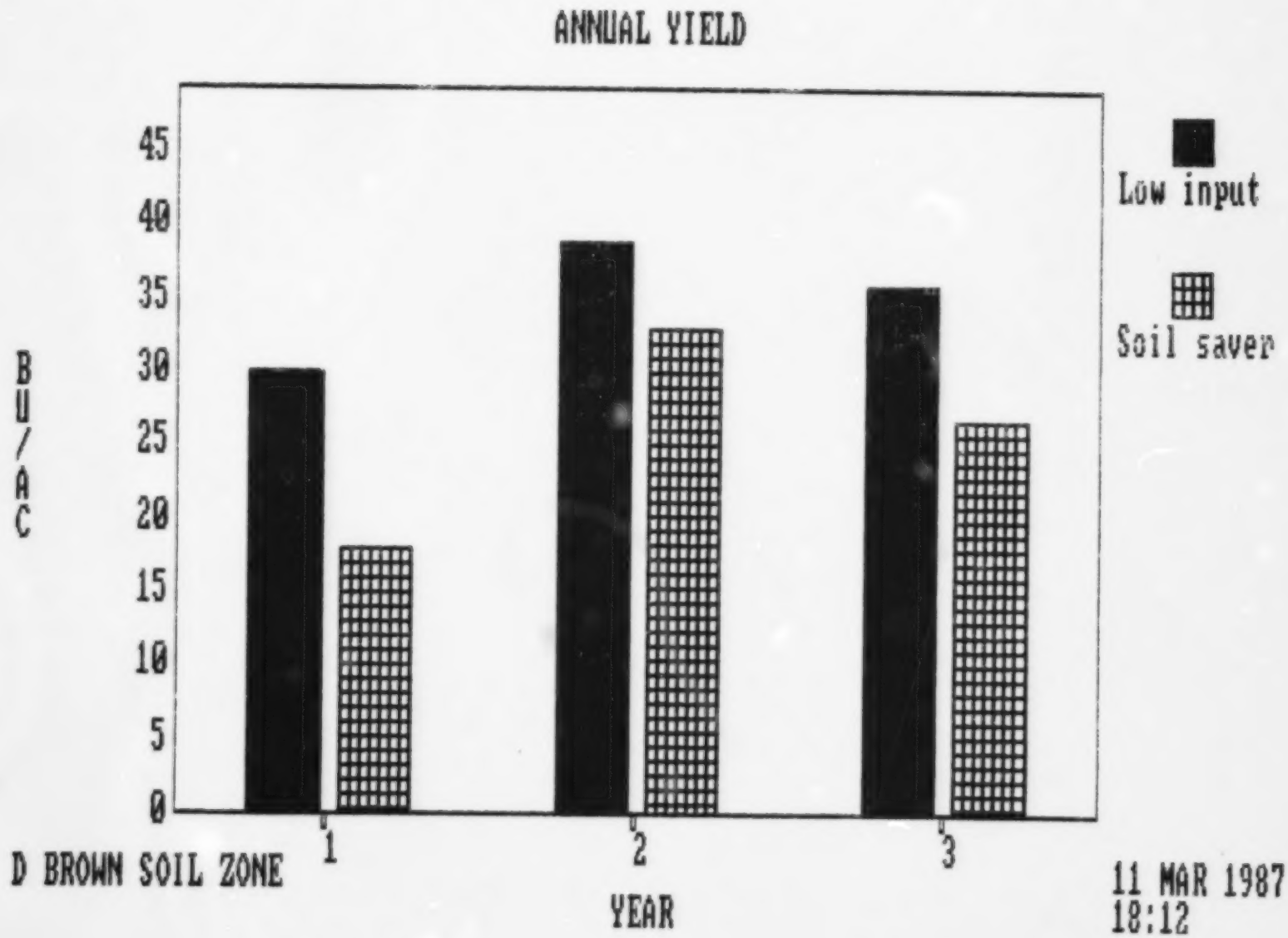
Quota price	3.00			-166,454	-36.99	-1.51	-55,485
	4.00			-61,304	-13.62	-0.56	-20,435
	5.00			43,846	9.74	0.40	14,615

SUMMARY OF SELECTED COSTS

Nitrogen Fert	21,000	21,000	26,654	68,654	15.26	0.62	22,885
Phosphorus Fert	9,000	9,000	9,000	27,000	6.00	0.24	9,000
Chemicals	18,000	18,000	18,000	54,000	12.00	0.49	18,000
Fuel	12,254	14,590	13,656	40,500	9.00	0.37	13,500
Power	2,250	2,250	2,250	6,750	1.50	0.06	2,250
Total	62,504	64,840	69,560	196,904	43.76	1.79	65,635

CASH FLOW SUMMARY

You have a deficit of $ -61,304 after 3 years. You need at least this much new debt to continue. If you replace any machinery or equipment, or have to pay any income tax, you will have to borrow money for that too.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40
35
30
25
20
15
10
5
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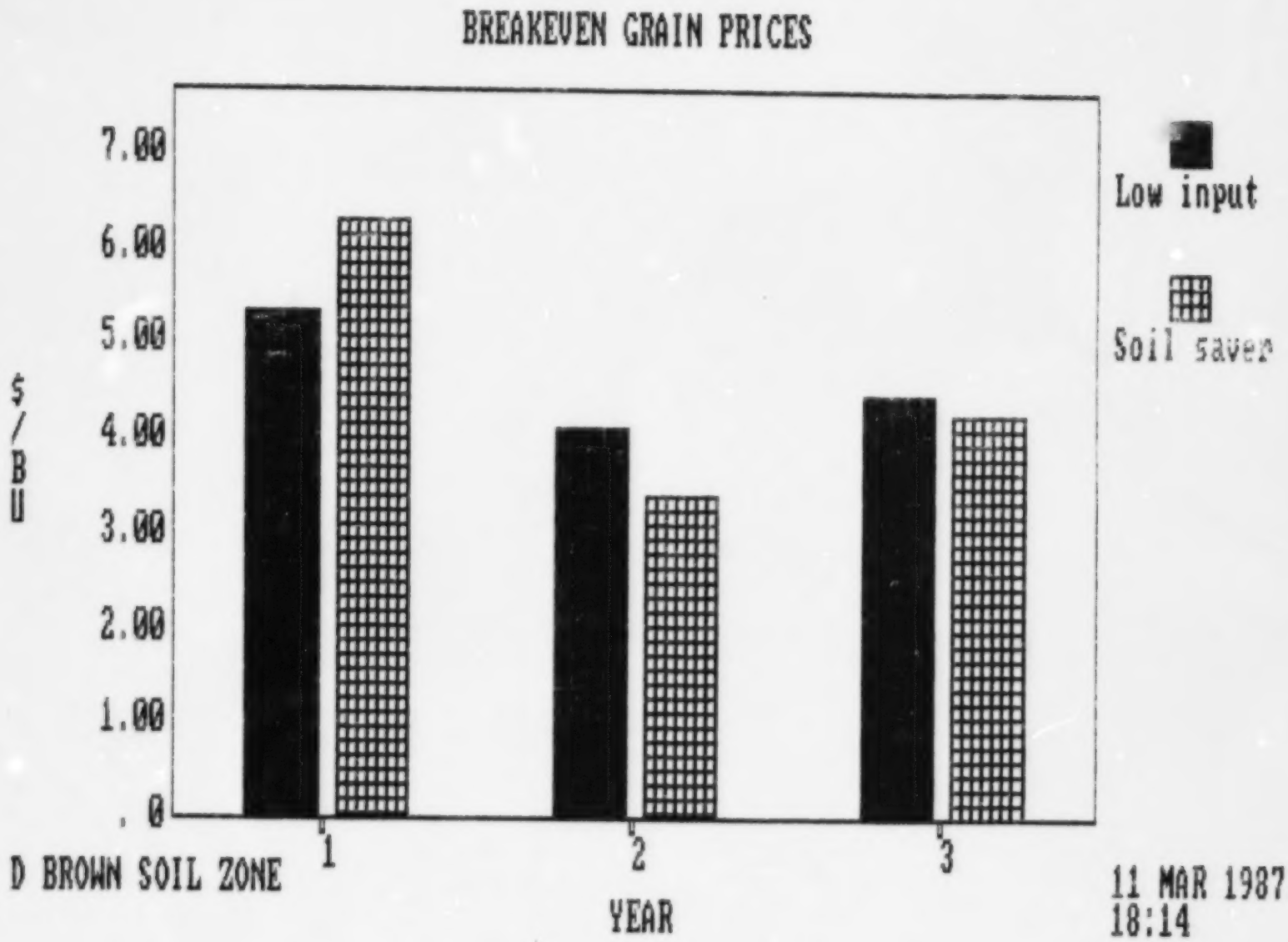
BU/AC
Low input
Soil saver
1
2
3
YEAR
D BROWN SOIL ZONE
11 MAR 1987
18:12


BREAKEVEN GRAIN PRICES
7.00
6.00
5.00
4.00
3.00
2.00
1.00
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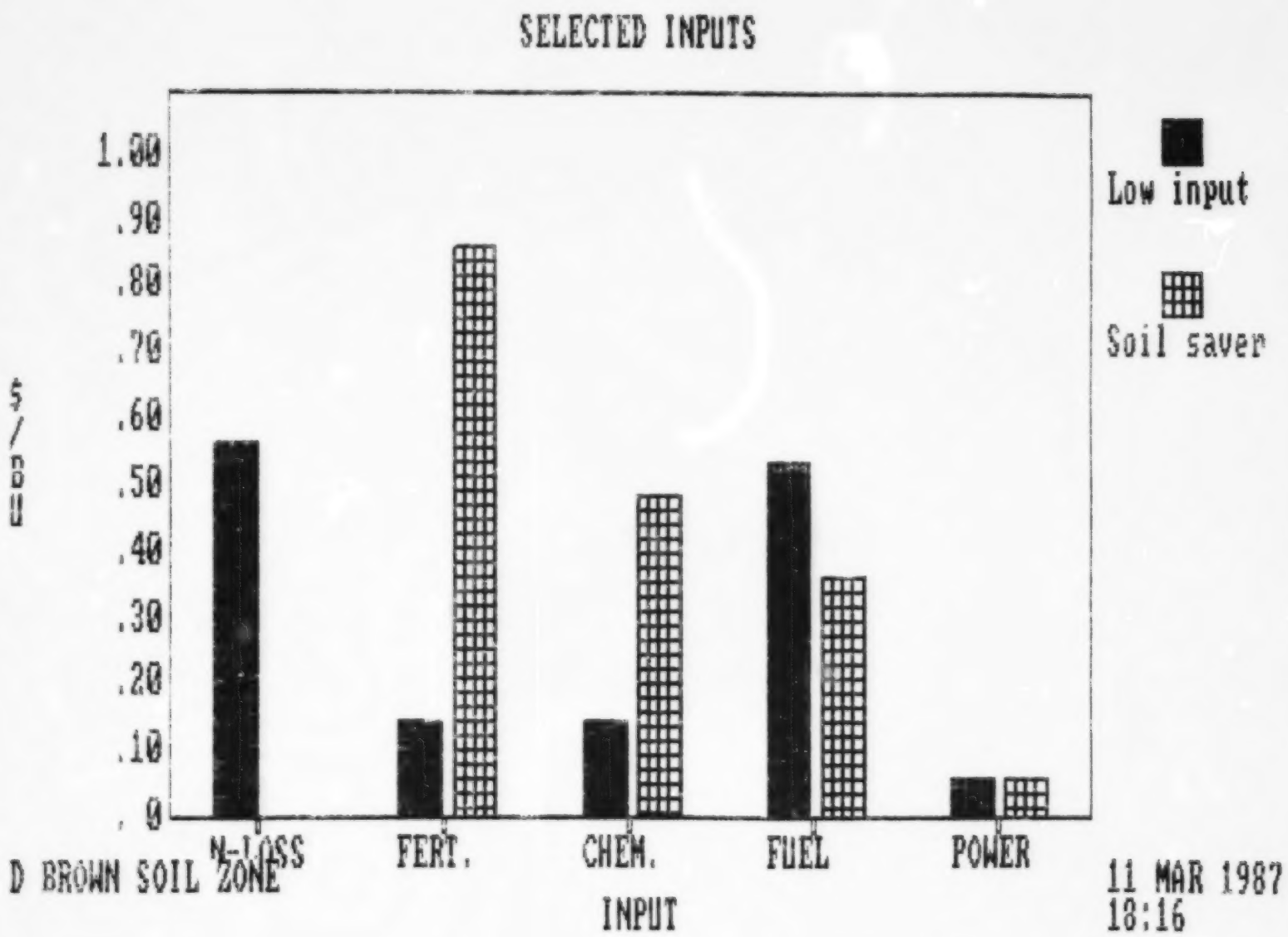
$/BU
Low input
Soil saver
1
2
3
YEAR
D BROWN SOIL ZONE
11 MAR 1987
18:14


SELECTED INPUTS
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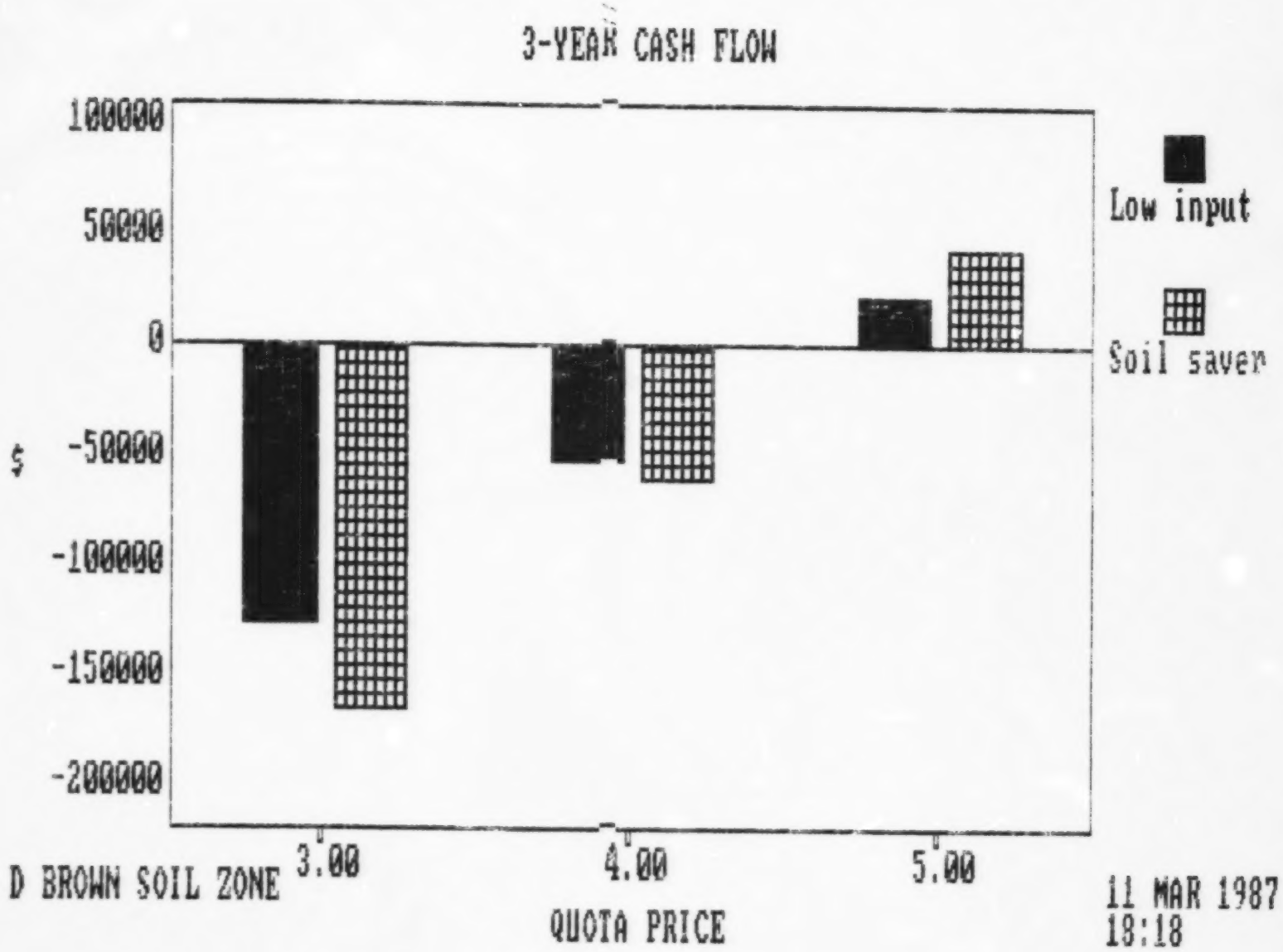
.80
.70
.60
.50
.40
.30
.20
.10
. 0
$/acre
N-LOSS
FERT.
CHEM.
FUEL
POWER
INPUT
Low input
Soil saver
D BROWN SOIL ZONE
11 MAR 1987
18:16


3-YEAR CASH FLOW
100000
50000
0
-50000
-100000
-150000
-200000
$
Low input
Soil saver
3.00
4.00
5.00
D BROWN SOIL ZONE
QUOTA PRICE
11 MAR 1987
18:18

CROPPING STRATEGY CASH FLOW ANALYZER
INPUT DATA
11 MAR 1987 — 18:21 h

CROPPING STRATEGY	(1-Low input 2-Soil saver)	1
LAND PRODUCTIVITY	(1-Light 2-Medium 3-Heavy)	2
R.M. NUMBER		428
NAME	(Last, First)	BLACK SOIL ZONE
CULTIVATED ACRES	(Acres)	1200
QUOTA ACRES	(Acres)	1200
QUOTA	(Bu/Acre)	15.0
QUOTA PRICE	($/Bu)	4.00
CROP INSURANCE THRESHOLD	(Bu/Acre)	0.0
DISCOUNT RATE	(Percent)	80
GRAIN IN STORAGE	(Bushels)	0
CARRY OVER STORAGE LIMIT	(Bushels)	0
LIVING EXPENSE	($/Year)	25000
DEBT SERVICE	($/Year)	25000
INFLATION RATE	(Percent)	+0
GRAIN PRICE TREND	(Percent)	+0
YIELD LAST YEAR	(Bu/Acre)	40
NUMBER OF YEARS IN PROJECTION	(1 to 8)	3
YIELD LOWER LIMIT	(Bu/Acre)	32
YIELD UPPER LIMIT	(Bu/Acre)	48
NITROGEN FERTILIZER	($/Crop Acre)	0.00
PHOSPHORUS FERTILIZER	($/Crop Acre)	6.00
CHEMICALS	($/Crop Acre)	6.00
FUEL	($/Cult Acre)	10.00
INSURANCE	($/Cult Acre)	4.50
REPAIR	($/Cult Acre)	9.00
R.M. TAXES	($/Cult Acre)	4.00
POWER	($/Cult Acre)	1.50
CUSTOM WORK	($/Cult Acre)	2.00
OTHER	($/Cult Acre)	12.00
NITROGEN LOSS	($/Fallow Acre)	22.00
RANDOM NUMBER SEED	(0 to 32767)	1017

YOU HAVE SELECTED:

A traditional low cost cropping system with half crop and half summerfallow

Your farm has 1200 cultivated acres, and
600 acres in crop

Grain Prices	$4.00/bu	quota price
	$3.20/bu	discount price
	+0%	yearly trend
Inflation	+0%	yearly trend
Yields	lower limit 32	bu/ac
	upper limit 48	bu/ac

CASH FLOW REPORT
11 MAR 1987 — 18:21 h

NAME: BLACK SOIL ZONE

YEAR	1	2	3	ACCUMULATED	$ PER CROP ACRE	$ PER BUSHEL SOLD	ANNUAL MEAN
PRODUCTION							
Bushels/Acre	36	44	41				40
Bushels	21,600	26,400	24,600	72,600			24,200
REVENUE							
Quota Sales	72,000	72,000	72,000	216,000	120.00	3.09	72,000
Discount Sales	8,640	24,000	18,240	50,880	28.27	0.73	16,960
Ins Claims Recd	0	0	0	0	0.00	0.00	0
Total Revenue	80,640	96,000	90,240	266,880	148.27	3.82	88,960
CASH OUTLAY							
Nitrogen Fert	0	0	0	0	0.00	0.00	0
Phosphorus Fert	3,600	3,600	3,600	10,800	6.00	0.15	3,600
Chemicals	3,600	3,600	3,600	10,800	6.00	0.15	3,600
Fuel	11,640	12,360	12,090	36,090	20.05	0.52	12,030
Insurance	5,400	5,400	5,400	16,200	9.00	0.23	5,400
Repairs	10,476	11,124	10,881	32,481	18.05	0.46	10,827
R.M. Taxes	4,800	4,800	4,800	14,400	8.00	0.21	4,800
Power	1,800	1,800	1,800	5,400	3.00	0.08	1,800
Custom Work	2,400	2,400	2,400	7,200	4.00	0.10	2,400
Other	14,400	14,400	14,400	43,200	24.00	0.62	14,400
Living Expenses	25,000	25,000	25,000	75,000	41.67	1.07	25,000
Debt Service	25,000	25,000	25,000	75,000	41.67	1.07	25,000
Total Cash Outlay	108,116	109,484	108,971	326,571	181.43	4.67	108,857
SURPLUS / DEFICIT	-27,476	-13,484	-18,731	-59,691	-33.16	-0.85	-19,897
Accum Surp / Def	-27,476	-40,960	-59,691				
Nitrogen Loss	13,200	13,200	13,200	39,600	22.00	0.57	13,200
Adjust Surp / Def	-40,676	-26,684	-31,931	-99,291	-55.16	-1.42	-33,097
Grain in Storage	0	0	0				0

YIELD SUMMARY

The average yield is 40 bu/ac. The expected annual deviation is 3 bu/ac.

SURPLUS / DEFICIT AS A FUNCTION OF QUOTA PRICE

Quota price	3.00			-126,411	-70.23	-1.81	-42,137
	4.00			-59,691	-33.16	-0.85	-19,897
	5.00			7,029	3.91	0.10	2,343

SUMMARY OF SELECTED COSTS

Nitrogen Fert	0	0	0	0	0.00	0.00	0
Phosphorus Fert	3,600	3,600	3,600	10,800	6.00	0.15	3,600
Chemicals	3,600	3,600	3,600	10,800	6.00	0.15	3,600
Fuel	11,640	12,360	12,090	36,090	20.05	0.52	12,030
Power	1,800	1,800	1,800	5,400	3.00	0.08	1,800
Total	20,640	21,360	21,090	63,090	35.05	0.90	21,030

CASH FLOW SUMMARY

You have a deficit of $ -59,691 after 3 years. You need at least this much new debt to continue. If you replace any machimery or equipment, or have to pay any income tax, you will have to borrow money for that too.

CROPPING STRATEGY CASH FLOW ANALYZER
INPUT DATA
11 MAR 1987 — 18:22 h

CROPPING STRATEGY	(1-Low input 2-Soil saver)	2
LAND PRODUCTIVITY	(1-Light 2-Medium 3-Heavy)	2
R.M. NUMBER		428
NAME	(Last, First)	BLACK SOIL ZONE
CULTIVATED ACRES	(Acres)	1200
QUOTA ACRES	(Acres)	1500
QUOTA	(Bu/Acre)	15.0
QUOTA PRICE	($/Bu)	4.00
CROP INSURANCE THRESHOLD	(Bu/Acre)	0.0
DISCOUNT RATE	(Percent)	80
GRAIN IN STORAGE	(Bushels)	0
CARRY OVER STORAGE LIMIT	(Bushels)	0
LIVING EXPENSE	($/Year)	25000
DEBT SERVICE	($/Year)	25000
INFLATION RATE	(Percent)	+0
GRAIN PRICE TREND	(Percent)	+0
YIELD LAST YEAR	(Bu/Acre)	32
NUMBER OF YEARS IN PROJECTION	(1 to 8)	3
YIELD LOWER LIMIT	(Bu/Acre)	20
YIELD UPPER LIMIT	(Bu/Acre)	44
NITROGEN FERTILIZER	($/Crop Acre)	18.00
PHOSPHORUS FERTILIZER	($/Crop Acre)	7.00
CHEMICALS	($/Crop Acre)	14.00
FUEL	($/Cult Acre)	10.00
INSURANCE	($/Cult Acre)	5.50
REPAIR	($/Cult Acre)	10.00
R.M. TAXES	($/Cult Acre)	4.00
POWER	($/Cult Acre)	2.00
CUSTOM WORK	($/Cult Acre)	2.50
OTHER	($/Cult Acre)	12.00
NITROGEN LOSS	($/Fallow Acre)	0.00
RANDOM NUMBER SEED	(0 to 32767)	1017

YOU HAVE SELECTED:

A high input conservation cropping system with all crop and no summerfallow

Your farm has 1200 cultivated acres, and
1200 acres in crop

Grain Prices
$4.00/bu quota price
$3.20/bu discount price
+0% yearly trend

Inflation +0% yearly trend

Yields lower limit 20 bu/ac
upper limit 44 bu/ac

CASH FLOW REPORT
11 MAR 1987 — 18:22 h

NAME: BLACK SOIL ZONE

YEAR	1	2	3	ACCUMULATED	$ PER CROP ACRE	$ PER BUSHEL SOLD	ANNUAL MEAN
PRODUCTION							
Bushels/Acre	26	37	33				32
Bushels	31,200	44,400	39,600	115,200			38,400
REVENUE							
Quota Sales	90,000	90,000	90,000	270,000	75.00	2.46	90,000
Discount Sales	22,080	64,320	48,960	135,360	37.60	1.23	45,120
Ins Claims Recd	0	0	0	0	0.00	0.00	0
Total Revenue	112,080	154,320	138,960	405,360	112.60	3.69	135,120
CASH OUTLAY							
Nitrogen Fert	21,600	21,600	24,975	68,175	18.94	0.62	22,725
Phosphorus Fert	8,400	8,400	8,400	25,200	7.00	0.23	8,400
Chemicals	16,800	16,800	16,800	50,400	14.00	0.46	16,800
Fuel	11,325	12,563	12,113	36,001	10.00	0.33	12,000
Insurance	6,600	6,600	6,600	19,800	5.50	0.18	6,600
Repairs	11,325	12,563	12,113	36,001	10.00	0.33	12,000
R.M. Taxes	4,800	4,800	4,800	14,400	4.00	0.13	4,800
Power	2,400	2,400	2,400	7,200	2.00	0.07	2,400
Custom Work	3,000	3,000	3,000	9,000	2.50	0.08	3,000
Other	14,400	14,400	14,400	43,200	12.00	0.39	14,400
Living Expenses	25,000	25,000	25,000	75,000	20.83	0.68	25,000
Debt Service	25,000	25,000	25,000	75,000	20.83	0.68	25,000
Total Cash Outlay	150,650	153,126	155,601	459,377	127.60	4.18	153,126
SURPLUS / DEFICIT	-38,570	1,194	-16,641	-54,017	-15.00	-0.49	-18,006
Accum Surp / Def	-38,570	-37,376	-54,017				
Nitrogen Loss	0	0	0	0	0.00	0.00	0
Adjust Surp / Def	-38,570	1,194	-16,641	-54,017	-15.00	-0.49	-18,006
Grain in Storage	0	0	0				0

YIELD SUMMARY

The average yield is 32 bu/ac. The expected annual deviation is 4 bu/ac.

SURPLUS / DEFICIT AS A FUNCTION OF QUOTA PRICE

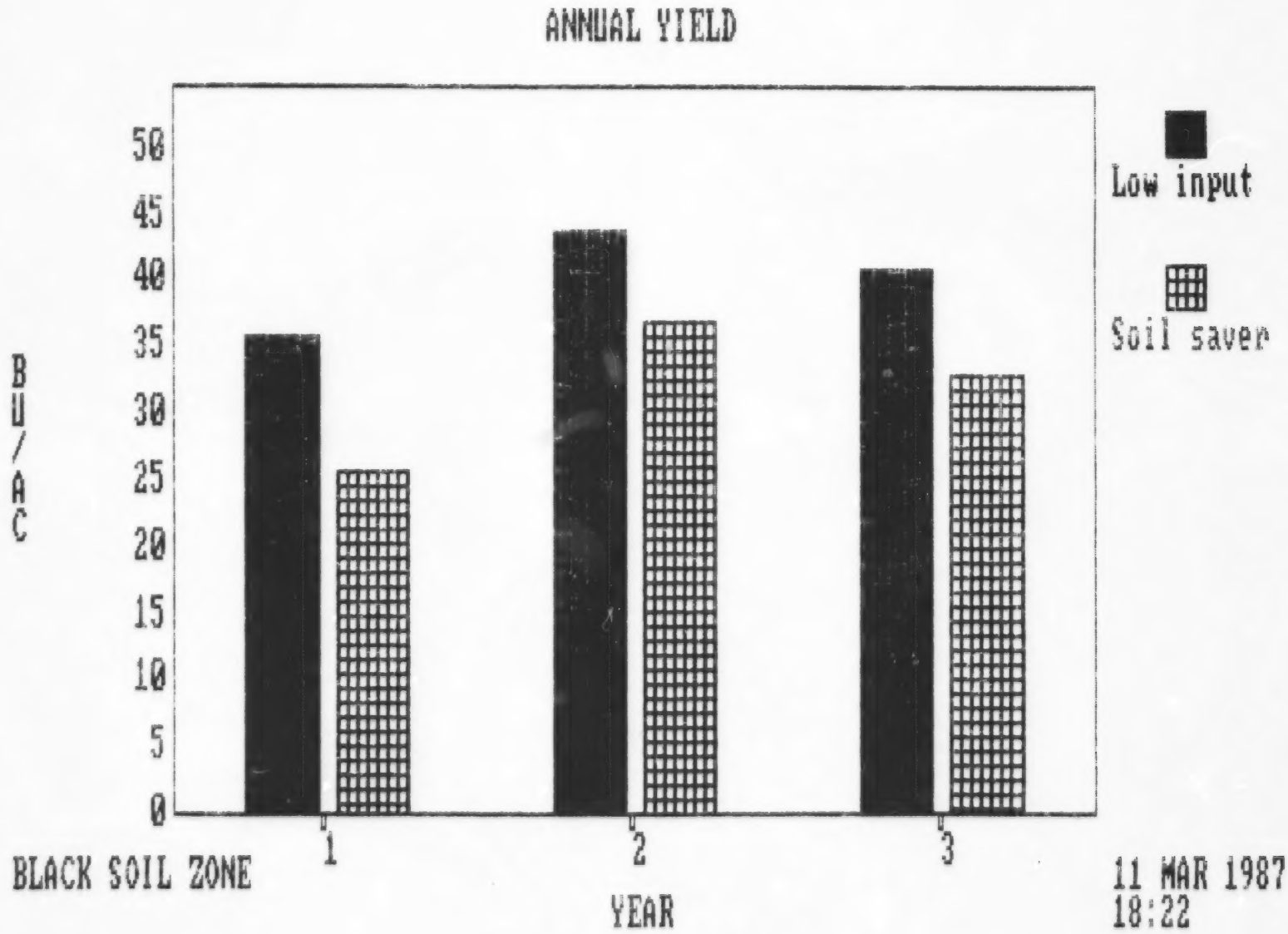
Quota price	3.00			-155,357	-43.15	-1.41	-51,786
	4.00			-54,017	-15.00	-0.49	-18,006
	5.00			47,323	13.15	0.43	15,774

SUMMARY OF SELECTED COSTS

Nitrogen Fert	21,600	21,600	24,975	68,175	18.94	0.62	22,725
Phosphorus Fert	8,400	8,400	8,400	25,200	7.00	0.23	8,400
Chemicals	16,800	16,800	16,800	50,400	14.00	0.46	16,800
Fuel	11,325	12,563	12,113	36,001	10.00	0.33	12,000
Power	2,400	2,400	2,400	7,200	2.00	0.07	2,400
Total	60,525	61,763	64,688	186,976	51.94	1.70	62,325

CASH FLOW SUMMARY

You have a deficit of $ -54,017 after 3 years. You need at least this much new debt to continue. If you replace any machinery or equipment, or have to pay any income tax, you will have to borrow money for that too.


ANNUAL YIELD
50
45
40
35
30
25
20
15
10
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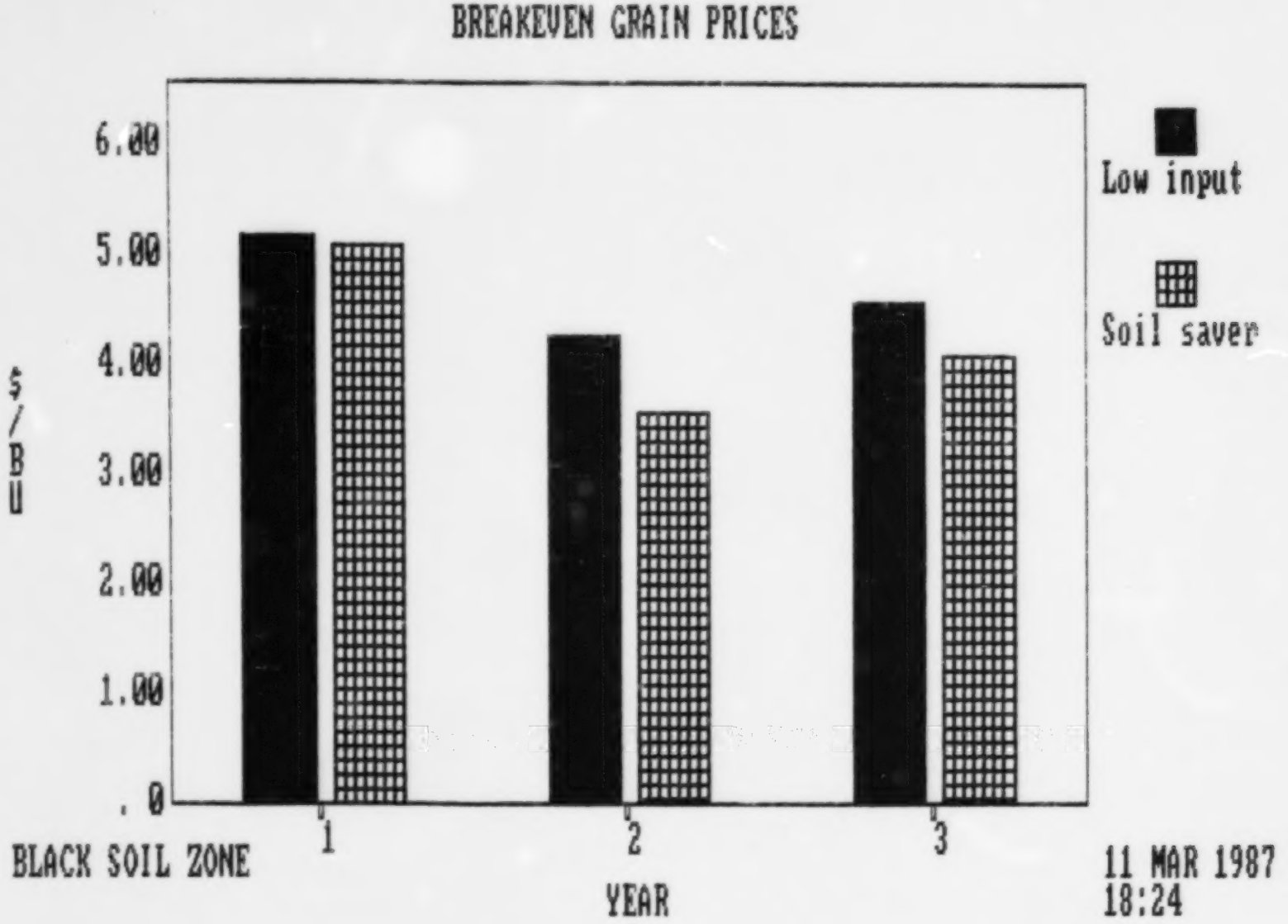
BU/AC
1
2
3
YEAR
Low input
Soil saver
BLACK SOIL ZONE
11 MAR 1987
18:22


BREAKEVEN GRAIN PRICES
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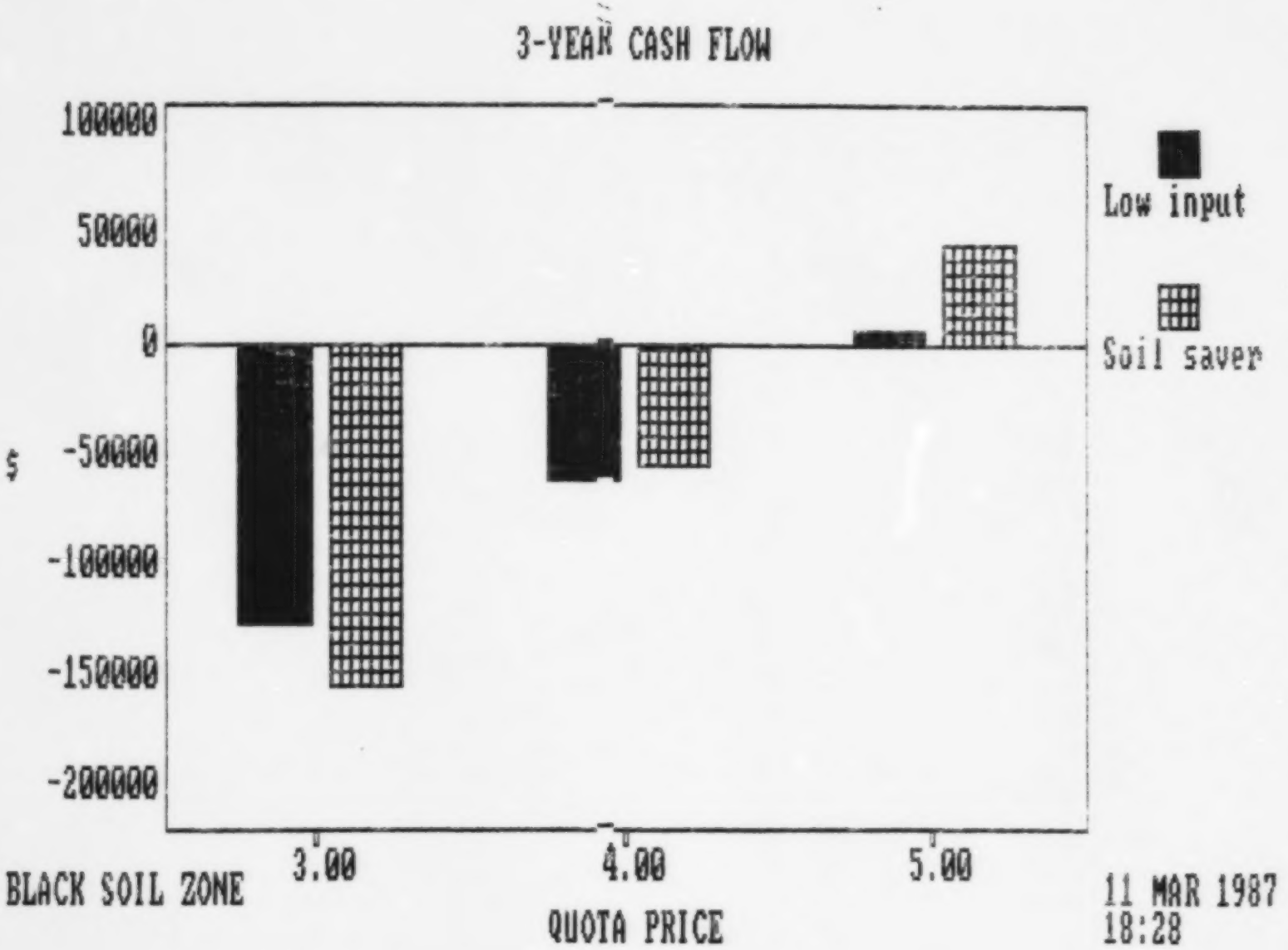
$/BU
Low input
Soil saver
1
2
3
YEAR
BLACK SOIL ZONE
11 MAR 1987
18:24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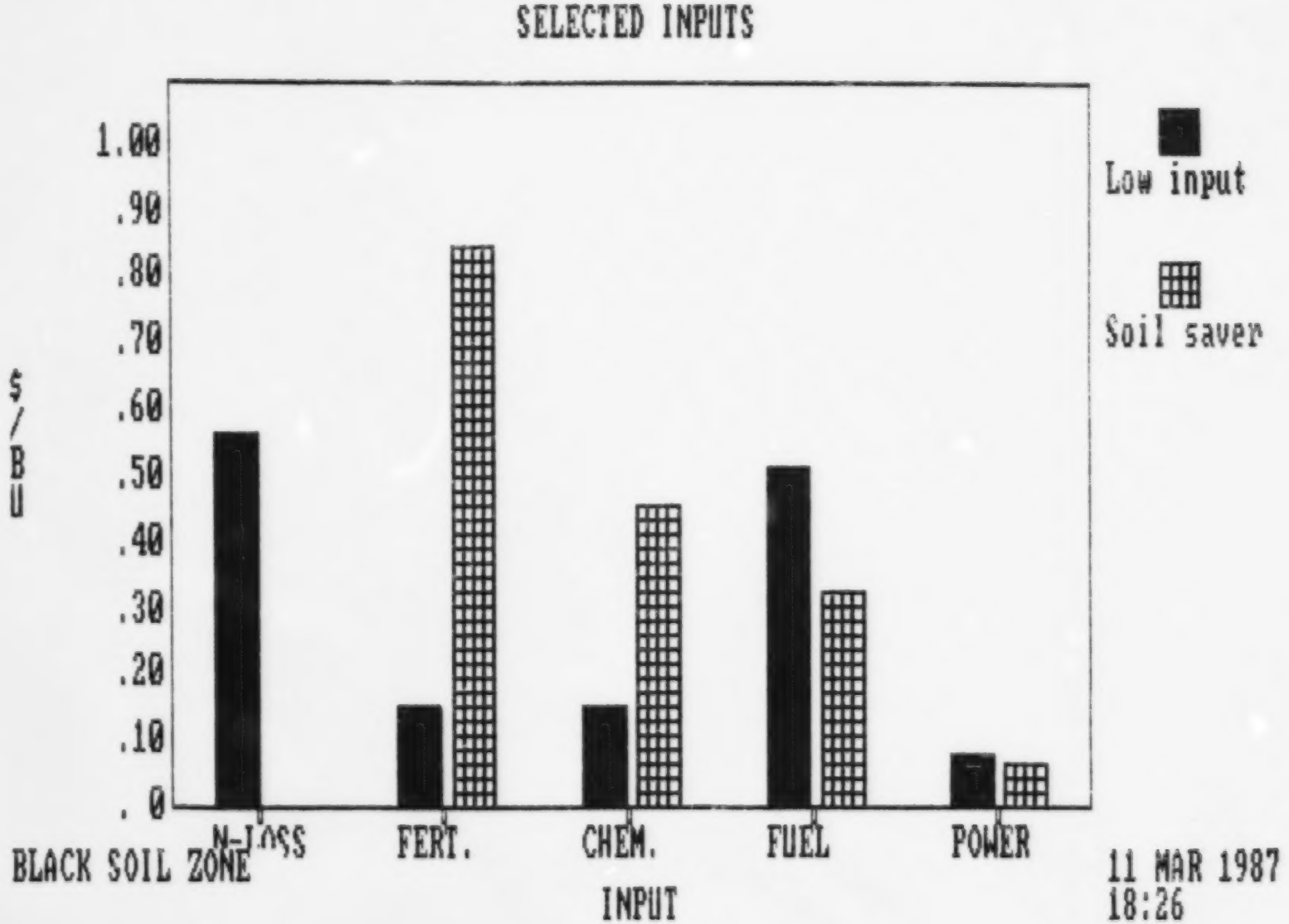
4.00
5.00
QUOTA PRICE
Low input
Soil saver
BLACK SOIL ZONE
11 MAR 1987
18:28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$/BU
N-LOSS
FERT.
CHEM.
FUEL
POWER
INPUT
Low input
Soil saver
BLACK SOIL ZONE
11 MAR 1987
18:26

FINAL REPORT

SRC - EMR CANADA

ENERDEMO PROJECT

TASK 2B